Malaguti
IDEE IN MOTO

B

Diagnostics Manual of the Electrical System and EMS Injection System

SPIDER MAX GT500

EURO 3

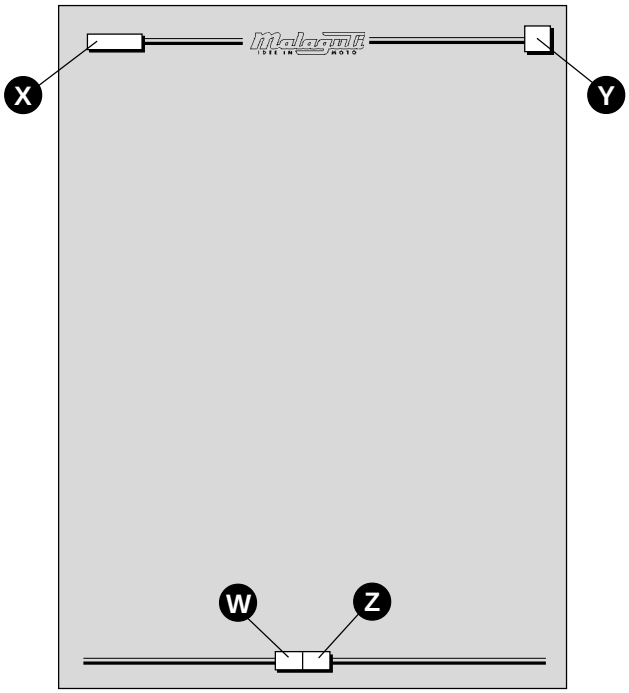
FOREWORD

- The present manual concerns all the necessary procedures aimed at **identifying electrical** (**Electronic Injection**) **system failures** and possible interventions for their resolution and provides to the **service personnel** (of Authorised Service Centres) the main information to work in compliance with the modern concepts of "**good** service" and "work safety".
- For further information refer to the **Service Manual - Cycle Parts, the Engine Service Manual** and the **Spare Part Catalogue**.
- All the operations described below must be carried out by skilled and experienced personnel.
- The procedures for the removal of bodywork and/or electrical and mechanical parts in order to access electrical cables or components are described in the Service Manual - Cycle Parts.
- We suggest following strictly the indications contained in the present document.
- For any further information, contact **Malaguti S.p.A**. Service Assistance.
- **It is important** to adhere strictly to the following instructions. Any operation carried out carelessly or not carried out at all may lead to personal injury, damage to the motorcycle or simply to unpleasant complaints.

REFERENCE NOTES

PAGE CONFIGURATION

X	Motorcycle model
Y	Section
W	Page no.
Z	Release date



ABBREVIATIONS USED IN THE MANUAL

F	Picture
P	Page
Pr	Paragraph
S	Section
Sch	Diagram
T	Table

MODIFIED PAGES

- Modified pages are indicated by the same number of the page in the previous edition, followed by an **M** and the **new release date**.
- It is possible that new pictures are inserted in the modified pages; if it is the case, the new picture (or pictures) will have the same number of the previous picture/s followed by a letter of the alphabet.
- In case of number omission, the picture number will be displayed on a black ground (e.g. F. 5).

ADDED PAGES

- Added pages are indicated by the last number of their section followed by an **A** and **the new release date**.

OPERATION SYMBOLS

	IMPORTANT!
	WARNING! - Used to indicate dangerous operation that can lead to the injury of service staff, workshop personnel or people in general or damage to the facility, the motorcycle or equipment.
	ENGINE OFF - Used for all the operations that must be carried out with engine off.
	VOLTAGE OFF - Disconnect the battery negative pole before the operation.
	MECHANICAL SERVICE STAFF - Operations that must be carried out by a skilled mechanic.
	ELECTRICAL SERVICE STAFF - Operations that must be carried out by a skilled electrician or electronic technician.
	NO! - Do not carry out this operation.

WARNING

- **Before any operation,** make sure that the motorcycle is in a perfectly stable position.
  We suggest to anchor the front wheel to the equipment fixed to the lifting platform.
- Use only well-known quality instruments to perform **checks and calibrations** and not empirical or not fully reliable equipments.
- **"Malaguti S.p.A."** cannot be held responsible for any damage resulting from the use of inadequate testing equipments for the check of electrical/electronical system.

- "**Malaguti"** reserves the right to change its motorcycles in any moment without prior notice.
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FIRST EDITION: 07/06

TECHNICAL DICTIONARY

• **Multimeter** (Tester) (cod. 08609500)

• **Diagnostic multimeter** (cod. 08607500)

• **Diagnostic wiring** (cod. 08607600)

• **Master Key** (red key cod. 09007000)

• **V = (DC)** : Direct current (battery supply)

• **V ~ (AC)** : Alternating current (flywheel supply)

• **A : Ampere** = Unit of measurement of the electrical current

• **W : Watt** = Unit of measurement of the electrical power (product of Volts and Amperes; **A x V = W**)

• **Ω : OHM** = Unit of measurement of the electrical resistance

• **OHM infinito** = Disconnected multimeter prods or interrupted cable

• **OHM = 0** : Continuity with connected multimeter prods or not interrupted cable

• **PIN** : Connector terminal

• **Linea** : Cable across two pins

• **<** = Lower

• **≤** = Lower or equal

• **>** = Higher

• **≥** = Higher or equal

• **KPa (or bar)** : Unit of measurement of pressure (100 Kpa = 1 bar)

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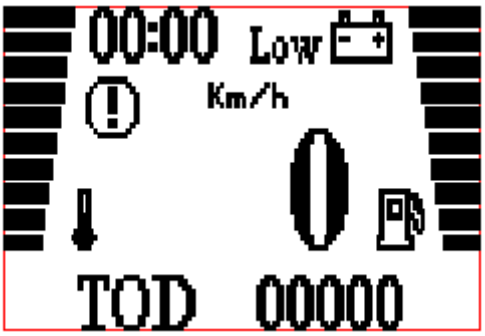
1. MAIN MENU FUNCTIONS (digital dashboard)



F. 1 Initial screen

1.1 Current speed function

The 3-coded digits information is displayed on the central part of the display (F. 1) while the selected unit of measurement (Km/h or Mph) is indicated above the speed 3 digits, which is updated every 0.5 seconds.

The parameters used by the system are the followings:

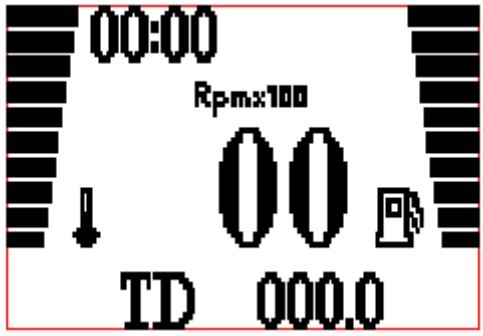
Circumf.	Imp./rev.	CT [imp/min]	Maximum speed	Overestimate	Resolution
1.828 mm	6	54,70	180 Km/h - 111 Mph	5% constant	1 Km/h - 1 Mph

CT= impulses per minute that the equipment needs to receive in order to display 1 real Km/h (overestimate excluded).

1.2 Revolution counter (RPM) function

The 3-coded digits information is displayed on the central part of the display (F 2) while “Rpmx100” appears above the 3 digits indicating the engine revolution number, which is updated every 0,5 sec.

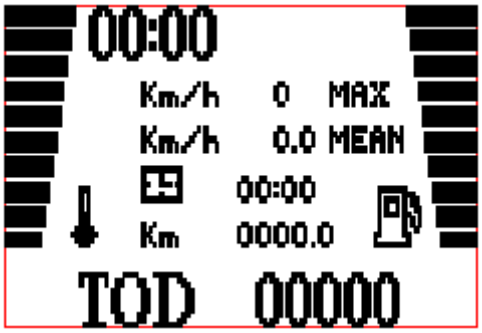
Refresh	Full scale	Resolution
500 m/sec	10.000 rpm	100 rpm



F. 2 RPM function

1.3 Trip memory function

Starting from the moment the key switch is set on the “ON position, the system detects and calculates the trip time, the distance covered, the motorcycle maximum and mean speeds (F. 3) until the switch is set back to the “OFF” position (sleep-mode).



F. 3 Trip memory

The parameters are calculated according to the following table:

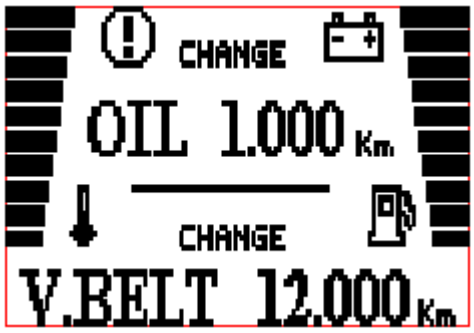
Function	Digits	Resolution	Maximum value	Refresh	Icon
Maximum speed	3 Digits	1 Km/h 1 Mph	180 Km/h - 111 Mph	5000 m/sec	MAX
Mean Speed	4 digits	0.1 Km/h 0.1 Mph	180 Km/h - 111 Mph	100m se v>0 5 sec se v=0	MEAN
Trip time	4 digits (hh:mm)	1 minute	99 hours 59min	1 minute	Clock icon
Distance covered	5 digits	0.1 Km 0.1 Mi	9999.9 Km - 9999.9 Mi	0.1 Km - 0.1 Mi	-

Information can be reset according to the following procedures:
- Distance covered overflow: after 99h59' the system automatically deletes all the Trip memory function data.
- Covered distance overflow: after 9999.9 Km (or 9999.9 Mi), the system automatically deletes all the Trip memory function data.
- Extended Sleep Mode: if the key switch remains on the “OFF“ position for more than 2 hours, the system automatically deletes all the Trip memory function data.
- Manual Reset: the user can reset all the Trip memory function data in any moment by pressing, for at least 2 seconds, the Mode button (beside the Trip memory function).

All the counters associated with the trip memory are saved in a volatile memory.

1.4 Preventive Maintenance Function (Service)

When selected, the preventive maintenance indicator displays the distance to be covered (decreasing counter) before the warning messages concerning OIL and V.BELT (F. 4) are displayed. More precisely, it indicates when it will be necessary to refer to an authorised service centre for OIL CHECK/ CHANGE or V. BELT CHANGE. When both the indicators associated with these two alarms display 0000, the corresponding warning message turns on and the counter stops being updated (it will continue indicating 0000), until the operation required is performed.



F. 4 Trip memory

OIL and V. BELT Service follows the parameters described below:

	I coupon		II coupon		III coupon		Following
	Distance	Type	Distance	Type	Distance	Type	
Oil	After 1000 Km	Change	After 2000 Km from the first one	Check	After 3000 Km from the second one change	Change	Alternate Check and Change every 3000 Km
V. Belt	Every 12000 Km a message prompting to replace the transmission belt to the converter (“Change” type alarm) is displayed.						

- The displayed information cannot be changed in any way.
- The information is expressed in Km or Miles.
- The value is stored in a non-volatile memory.

1.5 Radiator coolant temperature indicator function (WTEMP)

The information is displayed in graphic mode (by a ten-segment bar on the left hand side of the display) and by the switching on of the radiator coolant indicator (see F. 1). This function is displayed with any function selected or warning message on. Failure to connect the resistive sensor to the equipment is indicated by the blinking of the led and of the corresponding icon on the display (f=1Hz, duty=50%). In order to avoid displaying wrong readings, the sensor is read every 10 sec and the graphic bar is updated 1 segment by one. This means that, in case the sensor resistive value suddenly shifts from the maximum to the minimum value, it will take 90 seconds to display the 10 segments.
A temperature below 35 °C will be displayed by the partial switching on of the first segment of the graphic bar.
When the 10th segment is displayed, the led and the entire bar start blinking. The graphic bar operation is indicated in the following table:

Temperature	No. of segments	Sensor resistive value
<35°C	1 (partial)	> 1650Ω
35°C ÷ 45°C	1	From 1650Ω to 1000Ω
45°C ÷ 55°C	2	From 999Ω to 770Ω
55°C ÷ 70°C	3	From 769Ω to 400Ω
70°C ÷ 80°C	4	From 399Ω to 301Ω
80°C ÷ 90°C	5	From 300Ω to 216Ω
90°C ÷ 105°C	6	From 215Ω to 151Ω
105°C ÷ 110°C	7	From 150Ω to 130Ω
110°C ÷ 115°C	8	From 129Ω to 112Ω
115°C ÷ 119°C	9	From 111Ω to 95Ω
≥120°C	10 + Led	≤ 94Ω

1.6 Fuel level indicator function (FUEL)

The information is displayed in graphic mode (by a ten-segment bar, on the right hand side of the display) and by the switching on of the fuel icon (see F. 1). This function is displayed with any function selected or warning message on. Failure to connect the resistive sensor to the equipment is indicated by the blinking of the led and of the corresponding icon on the display (f=1Hz, duty=50%). The sensor is read every 5 sec and the bar is updated one segment by one. In order to avoid displaying wrong readings, caused by the fuel fluctuations in the tank, the graphic bar is updated only when the detected fuel level remains constant during three following readings with respect to the current reading. In case the sensor resistive value suddenly shifts from the maximum to the minimum value it will take 15sec*10 segments=150 seconds to display the 10 segments.
The 1st segment indicates the fuel reserve and cause the corresponding led to go on.

The graphic bar function is describe below:

Capacity	No. of segments	Sensor resistive value
3l ÷ 4l	1+Led	From 100Ω to 69Ω
4l ÷ 5l	2	From 68Ω to 61Ω
5l ÷ 6l	3	From 60,9Ω to 54Ω
6l ÷ 7l	4	From 53,9Ω to 47Ω
7l ÷ 8l	5	From 46,9Ω to 40Ω
8l ÷ 9l	6	From 39,9Ω to 33Ω
9l ÷ 10l	7	From 32,9Ω to 26Ω
10l ÷ 11l	8	From 25,9Ω to 19Ω
11l ÷ 12l	9	From 18,9Ω to 12Ω
≥ 12l	10	≤ 11Ω

2. SECONDARY MENU FUNCTIONS

2.1 Totaliser function (TOD)

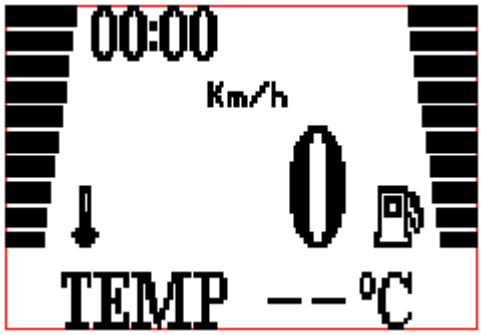
The information is displayed on the lower part of the display along with the icon TOD, as shown in F. 1. The 5-coded digit information is permanently stored in a non-volatile memory.
- If no data is stored in the memory the number 00000 is displayed.
- The information is expressed in Km or Miles (the equipment automatically converts the information into the required UM).
- This information cannot be reset during the normal use of the equipment.
- The displayed information resolution is 1 Km (1Mi)

2.2 Trip Function (TD)

The information is displayed on the lower part of the display along with the icon TD, as shown in F. 2. The 4-coded digit information is stored in a volatile memory. It is possible to reset the counter associated with this parameter by selecting the trip function and holding the button down until the value 000.0 appears (this procedure cannot be used after selecting the Trip memory function). Resetting is possible both with the motorcycle in motion and still.
- If no data is stored in the memory the number 000.0 is displayed.
- The information is expressed in Km or Miles (the equipment automatically converts the information into the required UM).
- The counter is reset and restarts after exceeding the number 999.9.
- The TD value IS NOT stored in the memory.
- The displayed information resolution is 0.1 Km (0.1Mi).

2.3 Air temperature function

The information is displayed on the lower part of the display along with the icon TEMP. The 2-coded digit (plus sign) information is stored in a volatile memory and is always expressed in Celsius degrees.
When the sensor is not properly connected to the equipment two horizontal dashes are displayed instead (F. 5).



F. 5 Outside temperature

- Strategy: the actual temperature detected by the sensor is displayed.
- The displayed function cannot be changed in any way.
- The information is updated every 0.5 sec.
- Displayed limits: -10 °C…..+ 55 °C.
- Measure tolerance: ±1°C.

2.4 Clock function (TIME)

The information concerning the current time is displayed on the upper part of the display, in hh:mm format (see F. 1). To adjust the current time, switch the motorcycle off and access the set-up menu.

- Displayed sequence: from 0:00 to 23:59.
- The information concerning the current time IS NOT stored in the memory.
- Clock precision: ± 2.5"/day.
- The Time function is always visible, except with the Preventive Maintenance function on.

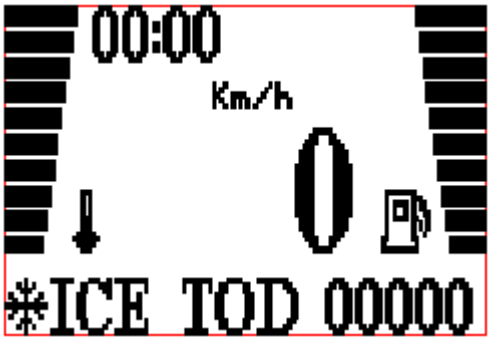
3. ALARM FUNCTION

3.1 ICE Alarm

In case the sensor reads a temperature below 4 °C, the system starts the alarm routine to warn that there could be ice on the street: with any function displayed, the system shows the message *** ICE (F. 6), which blinks for 15 seconds (f=1 Hz, duty=50%). After the indicated period of time, the display goes back to the function previously displayed while the * ICE icon moves to the lower left hand side of the display (and all the information usually displayed on this area will be moved to make room for the new blinking information (f=1 Hz, duty=50%) (see F.7). This configuration aims at warning the user that there may be ice on the street, but does not affect the equipment operation in any way: in fact all its functions are available beside the warning message. The alarm situation ends when the sensor reads a temperature above 5 °C. The whole sequence will be repeated every time that the read temperature is below or equal to 4°C and is interrupted whenever the read temperature is above or equal to 6°C.

F. 6 ICE alarm (after 15")

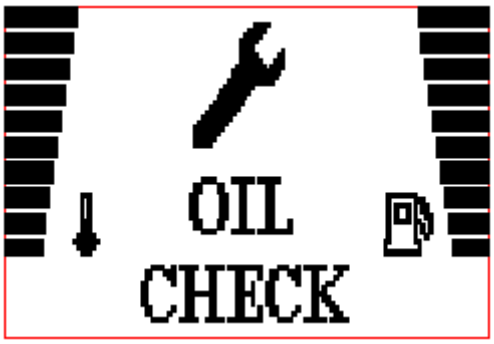
- While the warning message is on (15 sec.), the button function is disabled.
- While the warning message is on (15 sec.), the only functions that persist on the display are “Fuel” (fuel level indicator), “wtemp” (radiator coolant temperature) and hydraulic stand alarm (when present).
- The alarm is displayed with any function selected.
- When the selected function is “Service”, the alarm routine stops after 15 sec.



F. 7 ICE alarm (after 15")

3.2 Oil Check / Oil Change Alarm

The system is configured to show messages concerning the need for a check to be performed, as explained in paragraph 1.4.
The routine allows displaying the service icon along with the message OIL CHANGE or OIL CHECK going on and blinking (f=1 Hz, duty=50%) according to the type of alarm. The warning message lasts for 1 minute and goes on only when the key switch is on the “ON” position (F. 8). This algorithm will stay on until the Dealer who carries out the service operations, as indicated in paragraph, disables it. 6.4. After showing the message, the previously selected information will be displayed again.

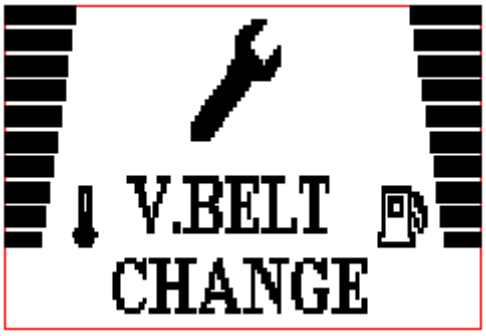


F. 8 OIL Service Alarm

- While the warning message is on (60 sec.), the button function is disabled.
- While the warning message is on (60 sec.), the only functions that persist on the display are “Fuel”(fuel level indicator), “wtemp” (radiator coolant temperature) and “hydraulic stand alarm” (when present).
- The alarm is displayed with any function selected.

3.3 V.Belt Change Alarm

The system is configured to show messages concerning the need for a check, as described in paragraph 1.4.
The routine allows displaying the service icon together with the message V.BELT CHANGE going on and blinking (f=1 Hz, duty=50%) (F. 9). The warning message lasts for 1 minute and goes on only when the key switch is on the “ON” position. This algorithm will stay on until the Dealer who carries out the service operations, as indicated in paragraph 6.5, disables it. After showing the message, the information previously selected will be displayed again.

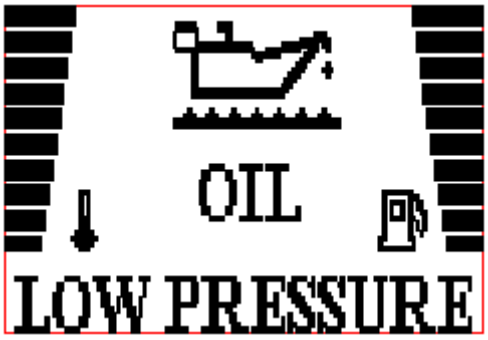


F. 9 V.BELT Service Alarm

- While the warning message is on (60 sec.), the button function is disabled.
- While the warning message is on (60 sec.), the only functions that persist on the display are “Fuel” (fuel level indicator), “wtemp” (radiator coolant temperature) and “hydraulic stand alarm” (when present).
- The alarm is displayed with any function selected.

3.4 Oil pressure indicator alarm (OIL LOW PRESSURE)

Every time that the sensor is closed to ground and Rpm10 is displayed, the corresponding warning message is shown on the display. The routine displays the blinking message OIL LOW PRESSURE (f=1 Hz, duty=50%), and the oil icon (F. 10). In order to avoid displaying false warning messages, this message appears only when the pressure switch remains closed to ground for a period of time not below 1.5 ÷ 2.0 seconds. The warning message will stay on until the sensor signal will be low (= ground), or until Rpm10 is reached. If the motorcycle engine is not running (Rpm =0), no warning message is displayed even if the pressure switch is closed to ground. In order to allow checking the equipment operation, the pressure switch closing is indicated during the 8 seconds subsequent to the key switch shift to the “ON” position, no matter whether there is signal on the rev. counter cable. After 8 seconds, the alarm will be displayed together with the number of rpm.



F. 10 OIL Alarm

The alarm is displayed with any function displayed.
• While the warning message is on (60 sec.), the button function is disabled.
• While the warning message is on(60 sec.), the only functions that persist on the display are "Fuel"(fuel level indicator), "wtemp" (radiator coolant temperature) and "hydraulic stand alarm" (when present).
• The alarm is displayed with any function selected.

3.5 Battery low alarm (VBATT)

When the battery charge is below the programmed threshold value the system starts the alarm routine. The battery icon is displayed along with the message LOW on the upper right hand side of the display (F. 1). This alarm signal does not affect the normal operation of the dashboard and is displayed with any selected function (in case the selected function is "Preventive Maintenance", only the battery icon is displayed - F. 4). The alarm situation ends when the charge exceeds again the threshold value.

3.6 Simultaneous alarms

In case of simultaneous alarms a different class of priority is given to each type of alarm described in the previous sections. More precisely the "hydraulic stand" alarm is given Priority 1 (the highest), while the OIL LOW PRESSURE and ICE alarms are given Priority 2 (lower than the previous one); the OIL CHECK/CHANGE and V. BELT CHANGE alarms are given Priority 3 and the "battery low" alarm is given Priority 4 (the lowest). The table below shows the different classes of priority:

Alarm	Priority
Hydraulic stand	1 (HIGH)
OIL low pressure	2
ICE	2
OIL check/change	3
V. BELT change	3
Low Battery	4 (LOW)

Imagining that all the types of alarm occur together, the system will act as follows:

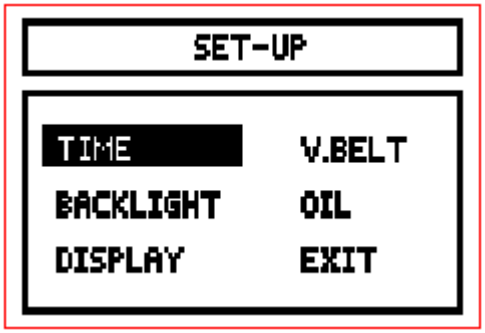
• The "hydraulic stand" alarm icon is always displayed, no matter if any other alarm is on.
• The warning message OIL LOW PRESSURE and ICE alternates every 5 seconds, while all the other alarms (OIL CHECK/CHANGE, V.BELT CHANGE and battery low) are set in the memory queue.
• After the ICE alarm (which lasts only 15 sec.), only the OIL LOW PRESSURE is displayed while all the other alarms (OIL CHECK/CHANGE, V.BELT CHANGE and "battery low") are set in the memory queue. In case the OIL BAR alarm (pressure switch opened or Rpm=0 rev./min.) only the ICE alarm is displayed while all the other alarms (OIL CHECK/CHANGE, V.BELT CHANGE and "battery low") are set in the memory queue.
• Only when the two alarms with Priority 2 (OIL LOW PRESSURE and ICE) go off, the system starts managing the alarms with Priority 3 (OIL CHECK/CHANGE and V.BELT CHANGE), alternating them every 5 seconds for a total duration of one minute each. The alarms with Priority 4 ("battery low") are set in the memory queue.
• Only when all the alarms with Priority 3 (OIL CHECK/CHANGE and V.BELT CHANGE) go off, the system starts managing the alarms with Priority 4 ("battery low") that are displayed according to the methods above described.

• After the alarm sequence is over, the system restores the display normal operation mode.
While the alarms with Priority 2 and 3 (ICE, OIL LOW PRESSURE, V.BELT CHANGE and OIL CHECK/CHANGE) are on, the button function is disabled.

4. SET-UP MENU

This menu allows accessing a series of functions used to:

- Adjust the current time (TIME).
- Adjust the equipment backlight (BACKLIGHT).
- Adjust display contrast and display mode (DISPLAY).
- Indicate to the system that Oil service has been performed (OIL).
- Indicate to the system that the variator belt has been replaced (V.BELT).



F. 11 Set-up menu

It is possible to access the Set-up menu only when the motorcycle is not in motion by pressing the mode button beside the TOD function for around 2 seconds, until the Set-Up screen is displayed (F. 11). Then press again the mode button to scroll the different functions until the needed function is displayed and press the button for around 2 seconds until the adjustment mode appears. After the adjustment operations are over, press the button beside the EXIT function for at least 2 seconds to go back to the standard operation mode.

Note 1: if the button is not pressed within 20 seconds from accessing the adjustment menu, the system automatically goes back to the standard operation mode.
Note 2: if the motorcycle engine is started (speed>0) after accessing the adjustment menu, the system automatically goes back to the standard operation mode.
Note 3: It is not possible to access the set-up menu when the "Trip memory" function is selected.

4.1 Current time adjustment (TIME)

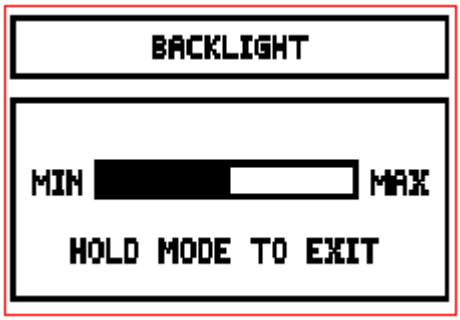
To adjust the current time press the mode button beside the message TIME (in the Set-Up window) for at least 2 seconds. At this point the only information displayed will be the current time (F. 11), blinking (f=1Hz, duty=50%). A short pressure of the mode button allows changing the hour value while a longer pressure (of at least 2 seconds) allows changing the minutes (that will be then be blinking), in the same way described for the hours. Press the button beside the EXIT function (for at least 2 seconds) to go back to the Set-up menu.

F. 12 TIME adjustment

Note 1: if the button is not pressed within 20 seconds from accessing the adjustment menu, the system automatically goes back to the standard operation mode.
Note 2: if the motorcycle engine is started (speed>0) after accessing the adjustment menu, the system automatically goes back to the standard operation mode.

4.2 Backlight adjustment (BACKLIGHT)

To adjust the backlight the low beams (and then the equipment backlight) must be lit. In this condition, press the mode button beside the word BACKLIGHT (in the Set-Up window) for at least 2 seconds to adjust the backlight (coded by a graphic bar, as shown in F. 13) and press for a short time the mode button until the required value is reached. To go back to the Set-up menu simply press the mode button for at least 2 seconds.



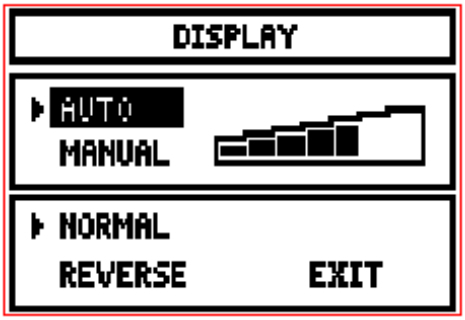
F. 13 Backlight adjustment

Note 1: If the low beams are switched off after accessing the adjustment menu, the system escs the adjustment function and save the last value set by the user.
Note 2: if the button is not pressed within 20 seconds from accessing the adjustment menu, the system automatically goes back to the standard operation mode.
Note 3: if the motorcycle is started (speed>0) after accessing the adjustment menu, the system automatically goes back to the standard operation mode.

4.3 Display contrast and mode adjustment (DISPLAY)

In order to adjust the display contrast and mode (Normal or Reverse image) simply press the mode button beside the word DISPLAY (in the Set-up window) for at least 2 seconds.
Two modes are possible for the display contrast adjustment (F. 14):

1) Automatic (default): the contrast optimal value, displayed by means of the graphic bar, is set automatically.



F. 14 Display adjustment

2) Manual: the user can adjust the required contrast value, displayed by means the graphic bar, manually. Actually it is a semi-automatic adjustment as, according to the display temperature function, the system allows the user adjusting the value only within a given range that ensures the display visibility.
   The automatic mode is set as default value. To select the manual mode simply press the mode button beside the word “Manual” for at least 2 seconds until a triangle, which indicates that the selection has been made, is displayed beside the same word. A short pressure of the mode button allows adjusting the required value.

Two different display mode adjustment procedures are possible:
1) Normal (default): only the necessary parts of the display are switched on while all the others (in the background) are switched off.
2) Reverse: it is the negative image of the previous mode where all the parts in the background are switched on while the parts selected to be displayed are switched off.
   The Normal mode is set as default value. To select the negative image mode by simply pressing the mode button beside the word “Reverse” for at least 2 seconds until a triangle which indicates that the selection has been made is displayed beside the same word.
   After the adjustment operations are over, press the button beside the EXIT function for at least 2 seconds to go back to the standard operation mode.

Note 1: if the button is not pressed within 20 seconds from accessing the adjustment menu, the system automatically goes back to the standard operation mode.
Note 2: if the motorcycle engine is started (speed>0) after accessing the adjustment menu, the system automatically goes back to the standard operation mode.

4.3.1 Display mode quick selection

The selection procedure of the (Normal or Reverse) display mode described in the previous paragraph could result quite difficult, for this reason, considering that the user may need to change the display mode quite often, a quick selection routine has been implemented allowing the user to carry out this operation while driving. This routine can be selected only when the STAND-BY function is selected. In the described situation, if the button is not pressed within 5 seconds, the system will display the TOD function. If the button is pressed for less than 2 seconds, the system changes the main menu function; if the button is pressed for more than 2 seconds, the system goes to the Set-up menu display function (F. 14), where the only options that can be selected are Normal and Reverse. It is possible to exit the menu in two ways:
1) without pressing the button within 20 seconds;
2) by selecting a display mode.

This procedure allows the user changing the display mode (from Normal to Reverse and vice versa) by simply holding the button down (after selecting the STAND-BY function) and without looking at the display. This routine, in fact, can be performed while driving and thus be quite dangerous for the user that could move his/her attention from the road to the display.

4.4 OIL ALARM de-activation (OIL)

The de-activation of the OIL CHECK or CHANGE ALARM must be performed only by authorised personnel according to the following procedure:
• Position the key switch on the “OFF” position.
• With the key on the “OFF” position, press the mode button.
• Holding the mode button down, move the key to the “ON” position.

At this point, the system will display the Set-up menu (F. 11), from which it is possible to select the OIL function (only OIL, V.BELT and EXIT can be selected). It is then possible to de-activate the OIL Alarm by pressing the button for at least 2 seconds. This procedure allows the authorised Dealer to inform the system that the service operations have been carried out and generates a confirmation message (OIL ALARM OFF) that will lasts for at least 15".

Note 1: While the confirmation message is on, the button function is disabled.
Note 2: The OIL ALARM can be de-activated at any time without waiting for the decreasing counter, associated with this function, to get to the zero.
Note 3: After de-activating the alarm, the system automatically sets the equipment to the standard operation mode. To access the de-activation configuration again, repeat all the operations above described.

4.5 V.BELT ALARM de-activation (V.BELT)

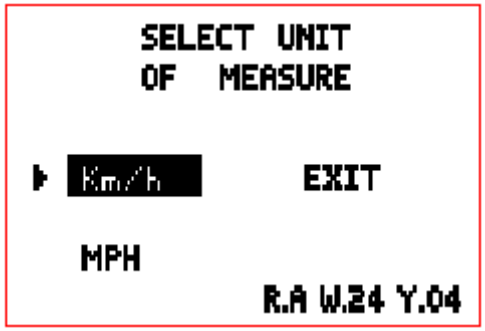
The V.BELT CHANGE ALARM de-activation must be performed only by authorised personnel according to the following procedure:
• Position the key switch on the “OFF” position.
• With the key on the “OFF” position, press the mode button.
• Holding the mode button down, move the key to the “ON” position.

At this point, the system will display the Set-up menu (F. 11), from which it is possible to select the V.BELT function (only OIL, V.BELT and EXIT can be selected), it is then possible to de-activate the V.BELT Alarm by pressing the for at least 2 seconds. This procedure allows the authorised Dealer to inform the system that the service operations have been carried out and generates a confirmation message (V.BELT ALARM OFF) that will lasts for at least 15".

Note 1: While the confirmation message is on, the button function is disabled.
Note 2: The V.BELT ALARM can be de-activated at any time without waiting for the decreasing counter, associated with this function, to get to the zero.
Note 3: After de-activating the alarm, the system automatically sets the equipment to the standard operation mode. To access the de-activation configuration again, repeat all the operations above described.

5. UNIT OF MEASUREMENT AND SOFTWARE REVISION SELECTION

Every time that the battery or the battery fuse are disconnected, the equipment prompts the user to select the unit of measurement (Km/h or Mph) by pressing the button while the main menu is displayed. The (one-letter coded) software revision, release week and year (F. 15) are shown in the same window.



F. 15 Unit of measurement and Software Revision selection

6. ANALOG EQUIPMENT: SPEEDOMETER

The equipment displays the value of the current speed in analog mode, through the stepper motor, according to the same principles described in paragraph 1.1.

7. WARNING LED FUNCTION

7.1 Fuel level indicator function

The system receives the information prompting to switch on the micro control device, as described in paragraph 1.6. If the resistive sensor is disconnected, the led starts blinking (f=1 Hz, duty=50%).

7.2 Radiator coolant temperature led function

The system receives the information prompting to switch on the micro control device, as described in paragraph 1.5. If the resistive sensor is disconnected, the led starts blinking (f=1 Hz, duty=50%).

7.3 Direction indicator led function

The system must activate the led when the connector inputs no. 2 and no. 16 are in a high state, when the direction indicators are switched on (see page 20).

The signal reaching the equipment must be already alternate.

7.4 High beam led function

The system must activate the led when the connector input no.15 is in a high state, when the high beams are switched on (see page 20).

7.5 Beam function led

The system must activate the led when the connector input no. 3 is in a high state, when the switching beams are switched on.

7.6 Injection function led

The system receives the information prompting to switch the micro control device on, according to the state of the input no. 20; a low logic state determines the led to switch on (see page 20).

7.7 Oil function led

The system receives the information prompting to switch the micro control device on, as described in paragraph 5.6.

7.8 Immobilizer function led

The system receives the information prompting to switch the connector input no. 22 on; a low logic state determines the led to switch on. The led can be turned on even when the key switch is moved to the “OFF” position (see page 20).

7.9 Side stand/engine stop function led

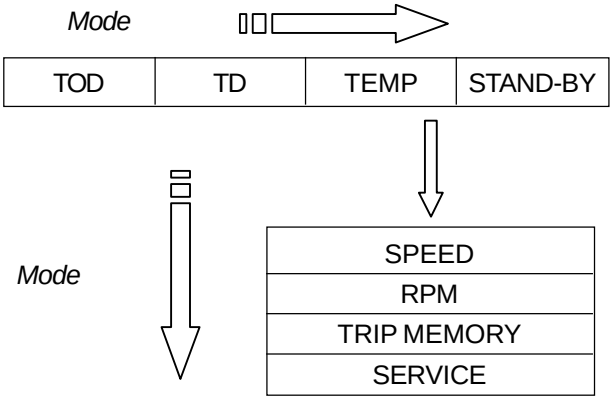
The system receives the information prompting to switch the micro control device on according to the state of input no. 12; a low logic state determines the led to switch on.

8. BACKLIGHT FUNCTION

8.1 LCD backlight function
The liquid crystal backlight is always on (unless the key switch is moved to the “OFF” position).

8.2 Dashboard backlight function
The dashboard backlight goes on only when the parking lights are turned on.

9. SEQUENCE OF THE DESCRIBED FUNCTIONS
To scroll the functions press the Mode button according to the sequence indicated in the table below



As already said in the previous chapters:
- It is possible to access the Set-up menu only when the motorcycle is not in motion (speed=0). It is not possible to enter the Set-up menu when the “Trip memory” function is selected.
- It is possible to reset the partial distance both with the motorcycle in motion or still. After selecting the TD function, reset the value by holding the button down (for around 2 seconds) until the number 000.0 is displayed. It is not possible to reset the TD function when the “Trip memory” function is selected.
- It is possible to reset the “Trip memory” both with the motorcycle in motion or still. After selecting the “Trip memory” function, reset the value by holding the button down (for around 2 seconds) until all the items of the function (distance covered, maximum and mean speed) are set to zero.

10. SYSTEM START-UP
When starting the engine (moving the key from the “OFF” to the “ON” position), the system will:
- check for the leds and backlight operation: for 3 sec all the leds are switched on (leds, backlight, immobilizer led, except the injection led, that is managed directly by the motorcycle central unit).
- Display the “Malaguti” Logo for around 1,5 seconds.
- Display the “Spider Max” Icon and the selected unit of measurement for around 1.5 seconds.
- Display the warning message “OIL BAR” (if the pressure switch is closed to ground) for 8 seconds, whether there is signal on the revolution counter cable.
- The system is set to the standard display.

11. SLEEP-MODE
Every time that the key switch is turned to the “OFF” position, the system:
- searches for the mechanical zero of the engine.
- switches off all the active leds, the dashboard backlight and the 12V output, where present.
- switches to a “sleep mode”, with power low consumption, system inactivity. The only function that remains on is the current time up dating.

12. EQUIPMENT FIRST INSTALLATION
The first time that the equipment is connected to the battery, all the pixels contained in the display are checked for around 5 seconds, and consequently the user is prompted to select one of the units of measurement (also the software revision is displayed in the same window).

13. TESTING PROCEDURE

This is a procedure very useful for a quick and reliable testing of the equipment inputs and the speedometer movement. To access the procedure follow the rules indicated below:

• Disconnect the equipment from the motorcycle battery.
• Connect the testing cable to ground (line no. 23)
• Restore the connection to the battery.

At this point, the system performs a display check by switching on the pixels, not all together, but line by line (each line made of 4 elements). When the testing is over, the system prompts the operator to insert the unit of measurement and, after displaying the “Malaguti” logo and the motorcycle icon, shows the current speed and the total covered distance (TOD). The functions cannot be scrolled and, every time that the button is pressed, the system checks for the operation of the leds (all leds, except the immobilizer led) and the speedometer. The latest covers all the scale travel (from the zero to the full scale value) and back. The testing routine ends when the equipment switches to the sleep mode. Whenever the key switch is moved to the to “ON” position again, the system switches to the standard operation mode, even if the testing cable is still connected to ground.

14. ELECTRICAL CHARACTERISTICS

General operating characteristics

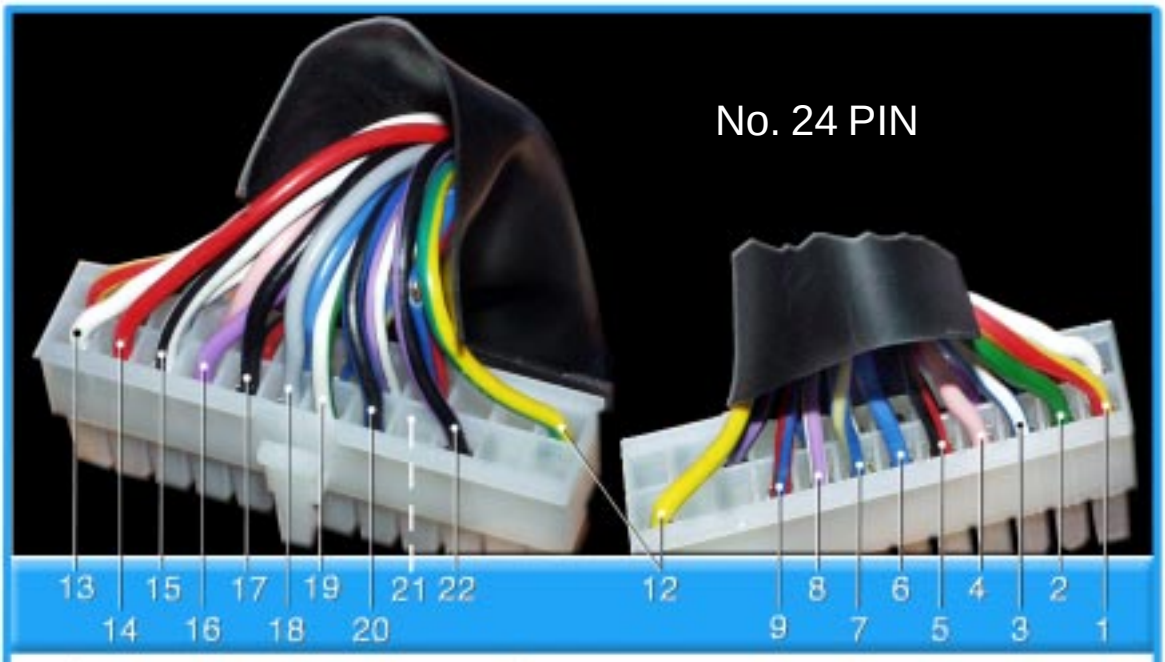
Param. No.	Characteristic	Icon	Min.	Max	Units
PM1	Max. operating voltage	VMAX	¾	17	V
PM2	Operating temperature	TSto	-20	+85	°C
PM3	Max power generated by **PIN** 16	IHall		20	mA
PM4	Max power that can be applied to inputs	IInMax	¾	20	mA
PM5	Max power that can be applied to outputs	IoutMax	¾	20	mA

General operating characteristics

Param. No.	Characteristic	Icon	Min.	Typ.	Max	Units
PO1	Supply voltage	VDD	6.0 (1)	12,0	16.0	V
PO2	Operative Temperature	TOp	-20	¾	+80	°C
PO3	Power consumption on the “ON” position with all the leds on (Battery voltage=12,5V)	Ion	¾	¾	470	mA
PO4	Power consumption on the “ON” position with all the leds on (Battery voltage=12,5V)	Ion_leds	¾	¾	120.2	mA
PO5	Power consumption in Sleep mode (Battery voltage=12,5V)	Islp	¾	¾	1	mA

(1) This parameter represents the minimum value of voltage that can be applied to the input without affecting the equipment operation. When said value is reached the optoelectronics components of the system (warning leds and backlight) are off.

15. DASHBOARD CONNECTOR CONFIGURATION



F. 16

No.	COLOUR		APPLICATIONS
1	YELLOW/RED		RPM
2	GREEN		RIGHT HAND SIDE DIRECTION INDICATOR
3	FAIR BLUE/WHITE		LOW BEAMS
4	PINK		PARKING LIGHTS
5	RED/BLACK		OUTSIDE TEMPERATURE
6	BLUE		KEY SWITCH POSITIVE CABLE
7	YELLOW/BLUE		ODOMETER TRANSMISSION SENSOR SUPPLY
8	WHITE/PURPLE		OIL PRESSURE
9	BLUE/RED		BATTERY POSITIVE CABLE
10	-		DISCONNECTED
11	-		DISCONNECTED
12	YELLOW/GREEN		SIDE STAND
13	WHITE		ODOMETER TRANSMISSION SENSOR SIGNAL
14	RED		BUTTON MODE
15	WHITE/BLACK		HIGH BEAMS
16	PURPLE		LEFT DIRECTION INDICATOR
17	BLACK		GROUND
18	GREY		FUEL LEVEL
19	WHITE/GREEN		DIRECTION INDICATOR
20	BLACK/BLUE		INJECTION LED
21	-		DISCONNECTED
22	PURPLE/BLACK		IMMOBILIZER LED
23	-		DISCONNECTED
24	-		DISCONNECTED

16. BATTERY (12V - 14 AH)

NOTE - The following information concerns the interventions on "non sealed" battery type.

The battery electrolyte contains sulphuric acid with is poisonous and can cause severe burnt. Avoid that the substance get in contact with eyes, skin or clothes. In case of contact with eyes or skin rinse thoroughly with water for some minutes and refer to a doctor. In case of ingestion, immediately drink a lot of water or milk followed by milk of magnesia, beated egg or vegetal oil and call a doctor.

The battery produces explosive gases; do not use bare flames, sparks or cigarettes; ventilate the room while recharging the battery in a closed environment. Always screen the eyes when working in the proximity of batteries. Keep out of the reach of children.

F. 17

- After removing hose and caps, pour battery-type sulphuric acid into the elements until reaching the upper level. The acid specific weight must be 1.26, that is to say 30 Bé, and its temperature below 15 °C.

1) Keep the densitometer in a vertical position.
2) Visually check the liquid density.
3) Release the float.

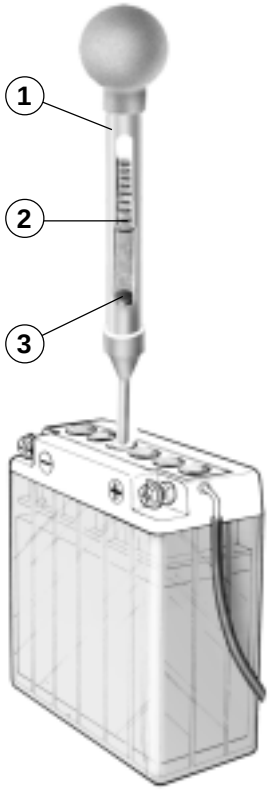
- Leave the battery rest for at least 2 hours and then top up with sulphuric acid.

- Recharge with a proper recharger within 24 hours at a voltage corresponding to around 1/10 of the battery rated capacity until the acid density reaches the value 1.27, that is to say to 31 Bé.

- After recharging the battery, top up the acid (adding **distilled water**). Close with the cap and clean with care.

- Once the above operations are over, fit the battery to the motorcycle, according to the wiring diagram indicated in the Service manual.

Black cables **battery (-) pole**
Red cables **battery (+) pole**



F. 18

16.1 Electrolyte level check

- Frequently check for the electrolyte level: it must reach the upper part of the battery. In order to top up the indicated level strictly use **distilled water**. In case water need to be added with unusual frequency, check for the motorcycle electrical system operation: the battery may be surcharged and this may reduce its lifetime.

16.2 Battery charge check

After topping up the electrolyte level, check the liquid density by means of a densitometer.
When the battery is fully charged, the electrolyte density should be around 30 ÷ 32 Bé, which correspond to a specific weight of 1.26 ÷ 1.28, at a temperature below 15 °C.
In case the measured density is below 20° Bé, the battery is completely flat and it is then necessary to recharge it.
In case the motorcycle is not used for certain period of time (1 month or over), remember to recharge the battery every now and then.

*The battery runs completely flat within 3 months. When fitting the battery back to the motorcycle make sure the cables are not inverted and always remember to connect the ground cable (**black**), with the (-) mark to the - **negative** terminal, and the remaining two **red** cables, with the (+) mark, to the + **positive** terminal.*

Before recharging the battery, remove all the element caps. Do not use bare flames, or sparks while recharging the battery.
Remove the battery from the motorcycle by disconnecting the negative terminal first.
To recharge the battery after disassembling it, use the specific recharger. Make sure to move the battery recharger switch to the type of battery to be recharged (that is to say, with a voltage corresponding to 1/10 of the battery rated capacity). Make sure to match the poles ("+" with "+" and "-" with "-") when connecting to the power supply.

We suggest to keep the battery clean, especially on its upper part and to protect the terminals with vaseline.

Never use fuses exceeding the recommended rated capacity. Failure to observe this rule may damage the motorcycle and/or represent explosion hazards.

Ordinary and drinkable water contains mineral salts that are corrosive to batteries. Never use a water type different from distilled water.

In order to ensure the battery best performances, recharge it before use. Failure to observe this indication before assembling it to the motorcycle may reduce the battery lifetime.

17. SEALED BATTERY

17.1 Sealed battery

The service operations simply concern the checking and recharging of the battery, when necessary.
These operations must be performed at the pre-delivery stage and every **6 months** in case the motorcycle is stored with the circuit open.
Besides pre-delivery checks, it is then necessary to check for the battery charge and to recharge it before storing the motorcycle and then every 6 months.

"RENEWAL" RECHARGE AFTER STORING THE MOTORCYCLE WITH OPEN CIRCUIT

1) Voltage check

Before fitting the battery to the motorcycle, check the open circuit voltage by means of a common multimeter.

• In case the voltage is **above 12,6 V,** fit the battery without recharging it.

• In case the voltage is **below 12,6 V, the battery needs a** "renewal" recharge. Proceed as follows:

2) Using a constant-voltage battery recharger.

- Recharge at constant voltage equal to 14,40 ÷ 14,70V;
- Initial recharge current = 0,3 ÷ 0,5 x rated capacity;
- Duration of recharge:
  Suggested 10 ÷ 12 h;
  Minimum 6 h;
  Maximum 24 h.

3) Using a constant-current battery recharger.

- Recharge current equal to 1/10 of the battery rated capacity.

18. “IMMOBASIC” TECHNICAL SPECIFICATIONS

18.1 Storing the keys for the first time

The device gets ready to store the two user keys immediately after connecting it to the power supply for the first time or until the two user keys have not been stored.
The LED stays on during the operation: it only switches off for a few seconds after storing the first and then the second key, blinking for three seconds - at 1Hz - to indicate that the two operations ended successfully and then it switches off completely.
In case the second key is not stored within two minutes from the device switching on or from the first key storing, the system holds the routine, and deletes the code entered for the first key. The entire procedure will then have to be repeated from the beginning next time the key is switched to ON.
The same is true in case of power failure happening while storing the first key and before the second key code is entered. When the power is restored, the system acts as it was the first switching on and prepares to store the data.
After storing the first key, the system excites the relays in order to allow starting the engine, in the motorcycle assembly line, without closing the routine.

18.2 Storing more keys

After performing the storing procedures described in paragraph 18.1, the system can be configured to store from one to four additional user keys.
In order to enable this function it is necessary to insert the MASTER KEY (cod. 09007000) within 10 seconds from the last “key-off”, made by using the valid key used as “key-on”.
In this way, the memory buffer is reset and all the keys that need to be stored as valid keys, included the one entered and recognised as MASTER KEY, must be inserted and switched to the “ON” position. After inserting the master key, the LED turns and stays on, switching off for a few seconds after every successful storing operation.
The routine closes after storing the fourth key or thirty seconds from the last key storing, and the LED switches off for three seconds, blinking in succession - at 1 Hz - a number of times corresponding to the number of stored keys.
All the data are actually stored in the memory only when closing the routine: the key codes, entered before starting the procedure, are thus stored even in case of power failure before closing the same.

18.3 Losing the keys

In case the keys are lost except at least one enabled key, follow the procedures described in paragraph 18.2 to update the memory with the codes of the new keys that need to be enabled.
In case all enabled keys are lost, it will be necessary to replace the entire device: (Keylock kit + Immobilizer).

18.4 Led blinking

In order to avoid that the battery runs down quickly, the LED that indicates that the ”immobilizer” function is enabled, stops blinking after 20 days.

19. RELAYS

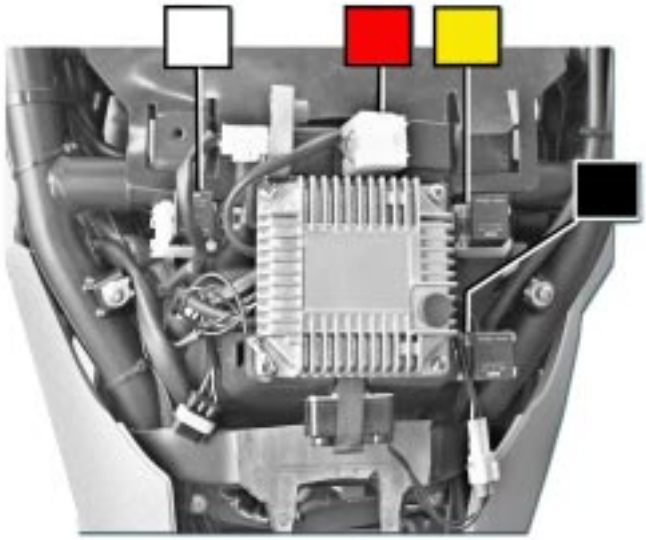
• The motorcycle is equipped with 5 relays located under the driver seat (see Service Manual – Cycle Parts).
• Each relay support has a different colour that indicates the relay specific function:

Starter permissive relay.

Starter permissive relay.

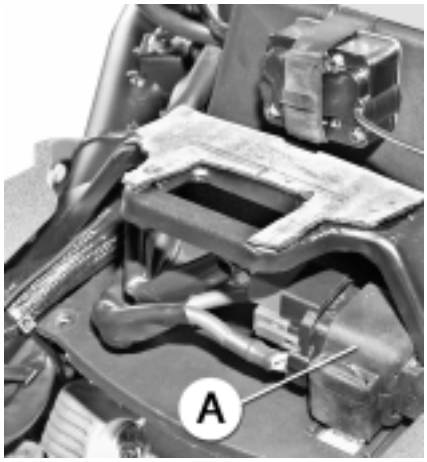
H.T. coil, injector, fuel pump supply.

Radiator fan supply



F. 19

19.1 Starter relay (A)



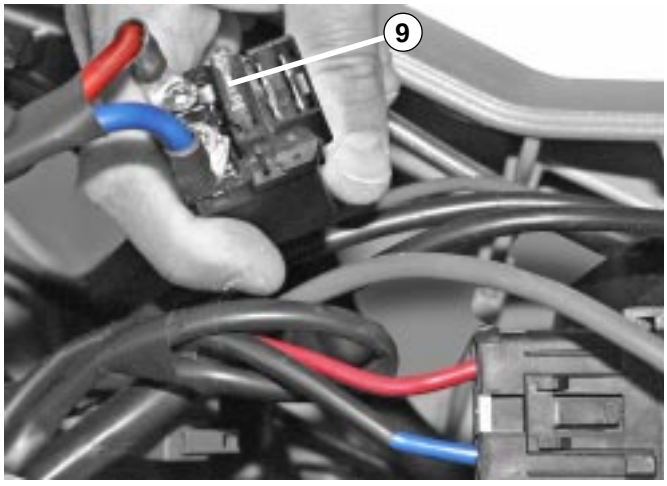
F. 19/a

NOTE *- A* ***30A fuse*** *(battery recharge protection) is located on the starter relay.*

In case the relay needs to be replaced, make sure to match the cable connection colours: red and blue.

RED - (battery → starter relay): connect to the (B) pole of the relay.

BLUE - (starter relay → starter motor) connect to the (M) pole of the relay.



F. 20

Inverting the cables interrupts the battery recharge operation.

20. FUSES

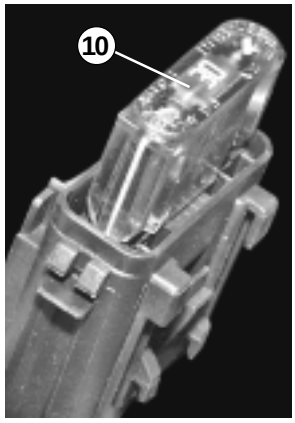
NOTE *- The Electrical system is equipped with 11 fuses.*

N	Amp	PROTECTED CIRCUITS
1	15	Lights
2	7,5	Direction indicators/parking lights
3	5	Dashboard electrical central unit
4	5	Relay: White - Red - Yellow
5	25	Relay: White - Red - Yellow
6	10	12 V (key switch)
7	7,5	H.T. coil - Injector - Fuel pump
8	3	Radiator fan
		Central unit supply

F. 21

No. 9	Amp	PROTECTED CIRCUITS	LOCATION
F. 20	30	BATTERY RECHARGE	STARTER RELAY

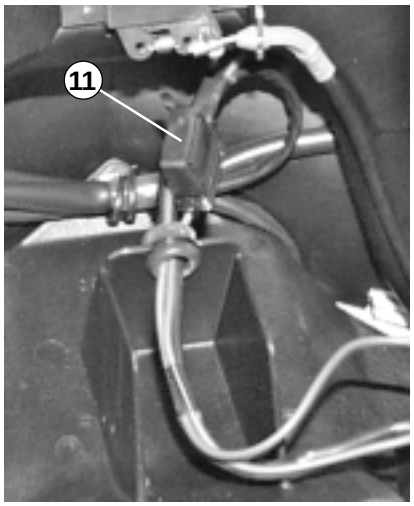
No. 10	Amp	PROTECTED CIRCUITS	LOCATION
F. 22	30	GENERAL	BATTERY COMPARTMENT



F. 22

No. 11	Amp	PROTECTED CIRCUITS	LOCATION
F. 23	5	12 V PLUG	UNDER THE HELMET COMPARTMENT

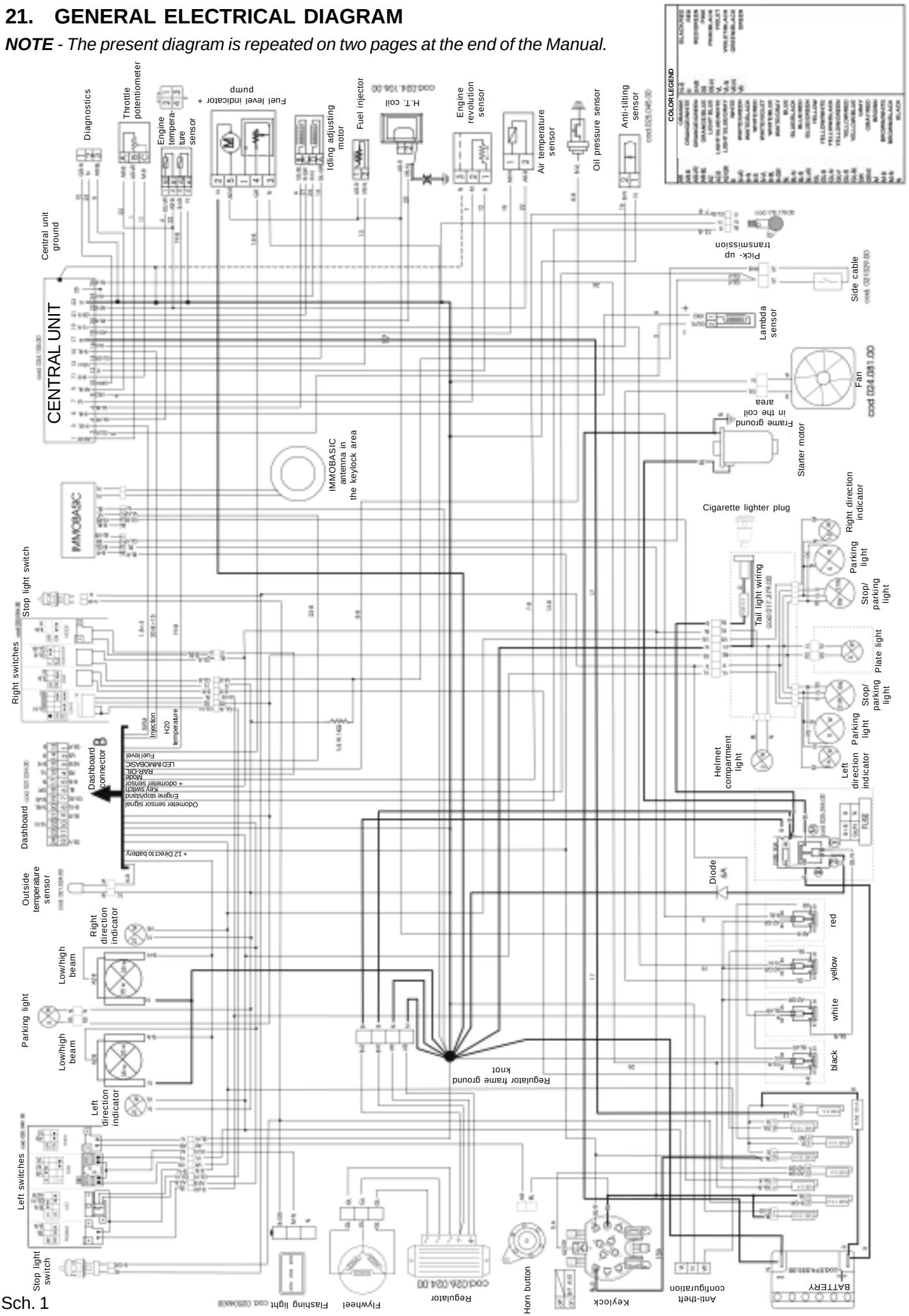
Before replacing the interrupted fuse, find and repair the cause of interruption.
Never attempt to replace the fuse by using different components (e.g. a piece of wire) or a fuse having amperage above the recommended one.



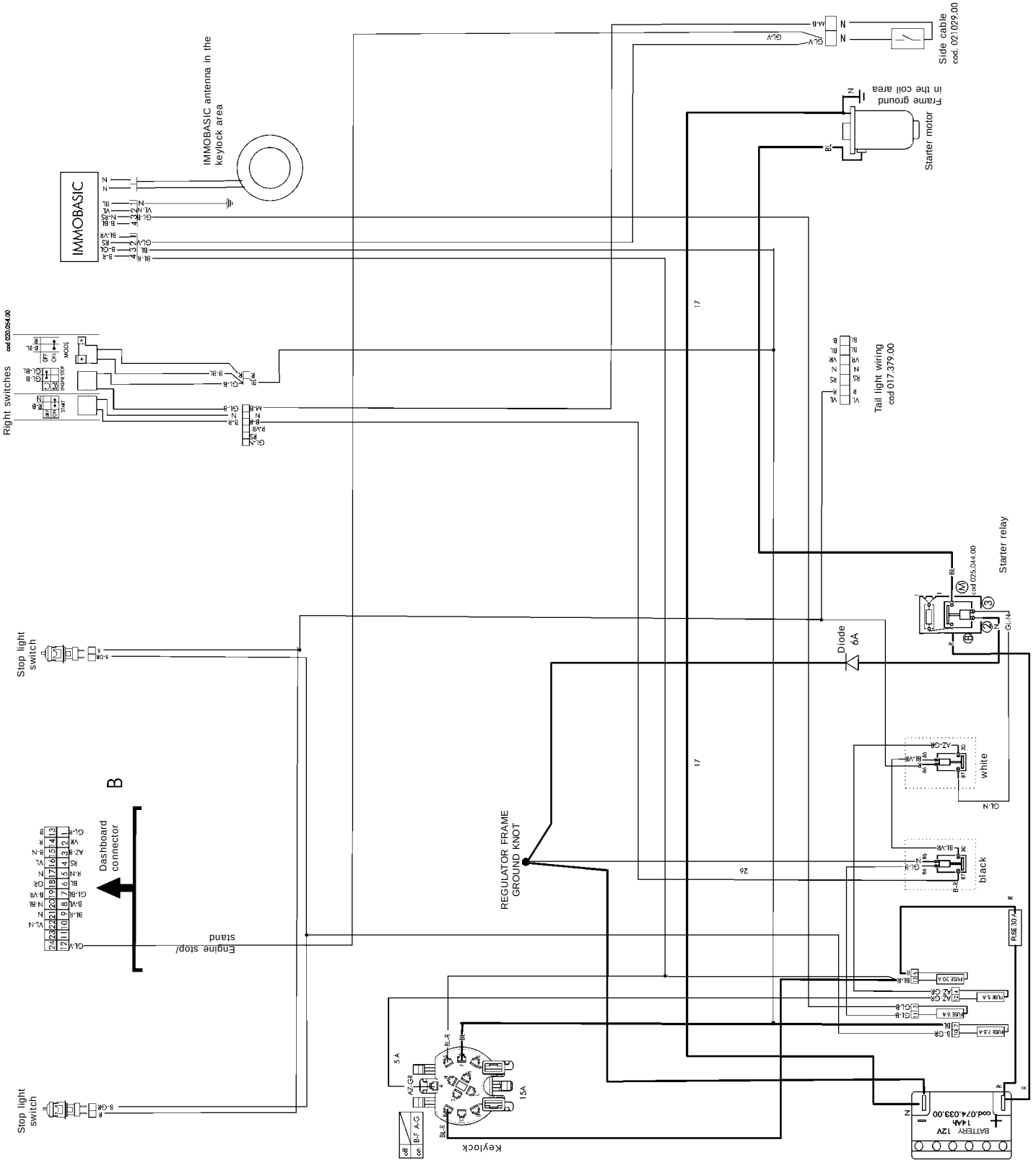
F. 23

21. GENERAL ELECTRICAL DIAGRAM

***NOTE** - The present diagram is repeated on two pages at the end of the Manual.*

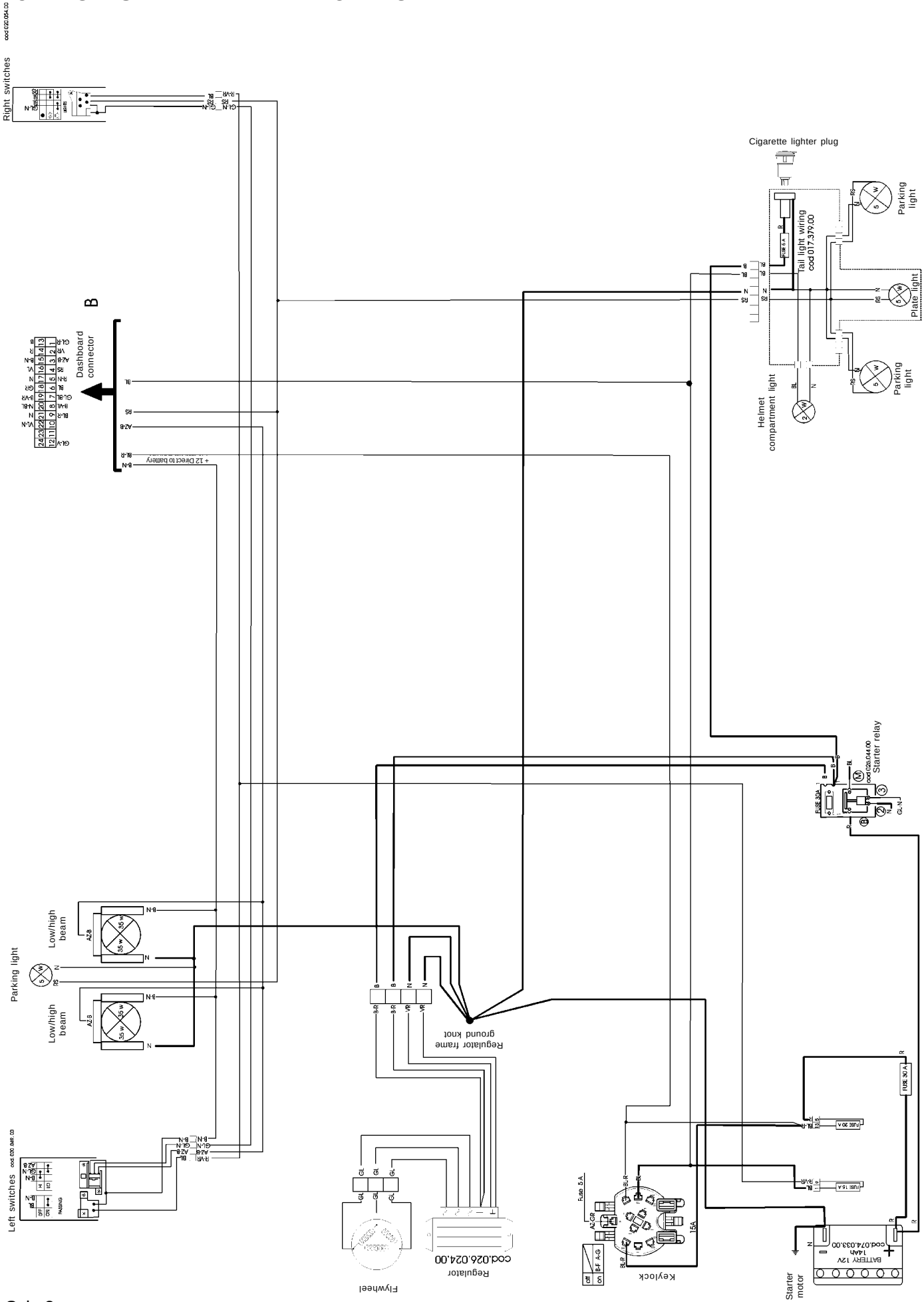


22. ELECTRICAL START-UP



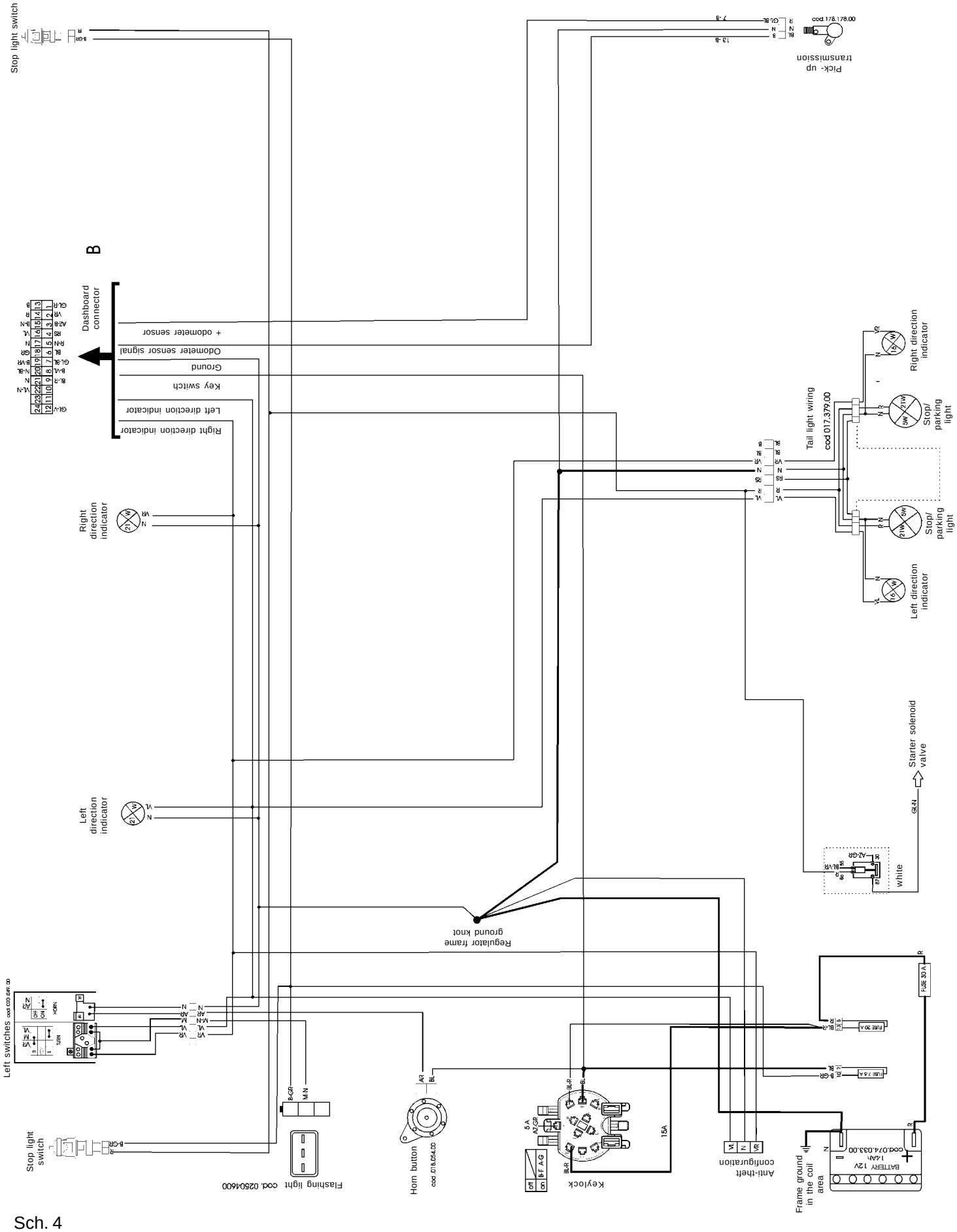
Sch. 2

23. LIGHTS AND BATTERY RECHARGE



Sch. 3

24. PARKING LIGHTS - DIRECTION INDICATORS - HORN BUTTON – SPEED SENSOR - ANTI-THEFT CONFIGURATION



Sch. 4

1. INTRODUCTION

The injection system is of the integrated injection and ignition system type.
The injection is indirect into the intake manifold through electro-injector.
Injection and ignition are timed on the 4-stroke cycle by means of a phonic wheel splined to the camshaft control and a reluctance change sensor.

Carburetion and ignition are managed according to the motor revolutions and the gas valve opening.
Further corrections are made according to the following parameters:
- Coolant temperature;
- Intake air temperature;
- Room pressure.

The system corrects the fuel supply at idling and cold engine by means of a stepper motor set on a by-pass circuit of the gas valve. The central unit controls the stepper motor and the injector opening time, thus ensuring stability at idling speed and correct carburetion.

In all operating conditions, the carburetion control depends on the changing of the injector opening.
The fuel supply pressure is kept constant in relation to the room pressure.

The **supply circuit** is made of:
- a fuel pump;
- a fuel filter;
- an injector;
- a pressure regulator.

The pump, filter and regulator are assembled inside the fuel tank by means of a single support.
The injector is connected by means of two quick coupling hoses that allows getting a continuous circulation, avoiding thus that the fuel gets to its boiling point. The pressure regulator is fitted to the end of the circuit.
The fuel pump is operated by the EMS central unit which ensures a safe motorcycle operation.

The **ignition circuit** components are:
- H.T. coil;
- H.T. cable;
- Shielded cap;
- EMS central unit;
- Spark plug.

The EMS central unit controls the ignition with the optimal spark advance, thus ensuring the 4-stroke timing (ignition occurs only during the compression phase).

The EMS injection-ignition system controls the engine operation by means of a preset program. Should any of the input signals miss, a basic engine operation is ensured in order to allow the driver reaching the nearest service centre.

Obviously this is not possible in case the engine rpm/speed signal is missing or when the anomaly inthe control circuits of the:
- fuel pump
- H.T. coil
- injector.

2. PRECAUTIONS

1. Before any intervention on the injection system, check for any anomaly recorded.

   Do not disconnect the battery before performing the anomaly check.
2. The fuel supply system pressure is 300 KPa (3 BARS). While disconnecting the quick coupling of the fuel supply system hose, do not use bare flames and do not smoke. Be careful, the fluid may splash and get in contact with the eyes.
3. While servicing the electrical components, do not leave the battery connected unless it is strictly necessary.
4. When checking the operation functions, make sure that the battery voltage is above 12V.
5. Before trying to start up the engine, make sure that the tank contains at least 2 litres of fuel. Failure to observe this precaution may damage the fuel pump.
6. In case the motorcycle is not used for a certain period of time, refill the tank up to half of its capacity so that the pump is plunged into the fuel.
7. While washing the motorcycle, do not pour water on electrical components and cables.
8. In case of anomalies in the ignition system, first check the battery and the injection system connections.
9. Before disconnecting the EMS central unit connector, carry out the following operations, in the indicated order:
   - Position the key switch on the “OFF” position;
   - Disconnect the battery;
   Failure to observe this instruction may damage the central unit.
10. When reassembling the battery, take care not to invert the poles.
11. In order to avoid any damage, avoid disconnecting and reconnecting the EMS system connectors unless it is strictly necessary.
    Before reconnecting them, check connectors for humidity.
12. While performing electrical checks, do not force the multimeter prods into the connectors. Do not carry out any measurements not indicated by the Manual.
13. After performing the test by means of the diagnostic multimeter, remember to protect the system connector with the special cap. Failure to observe this rule may damage the EMS central unit.
14. Before reconnecting the fuel supply quick couplings, check that the terminals are properly cleaned.

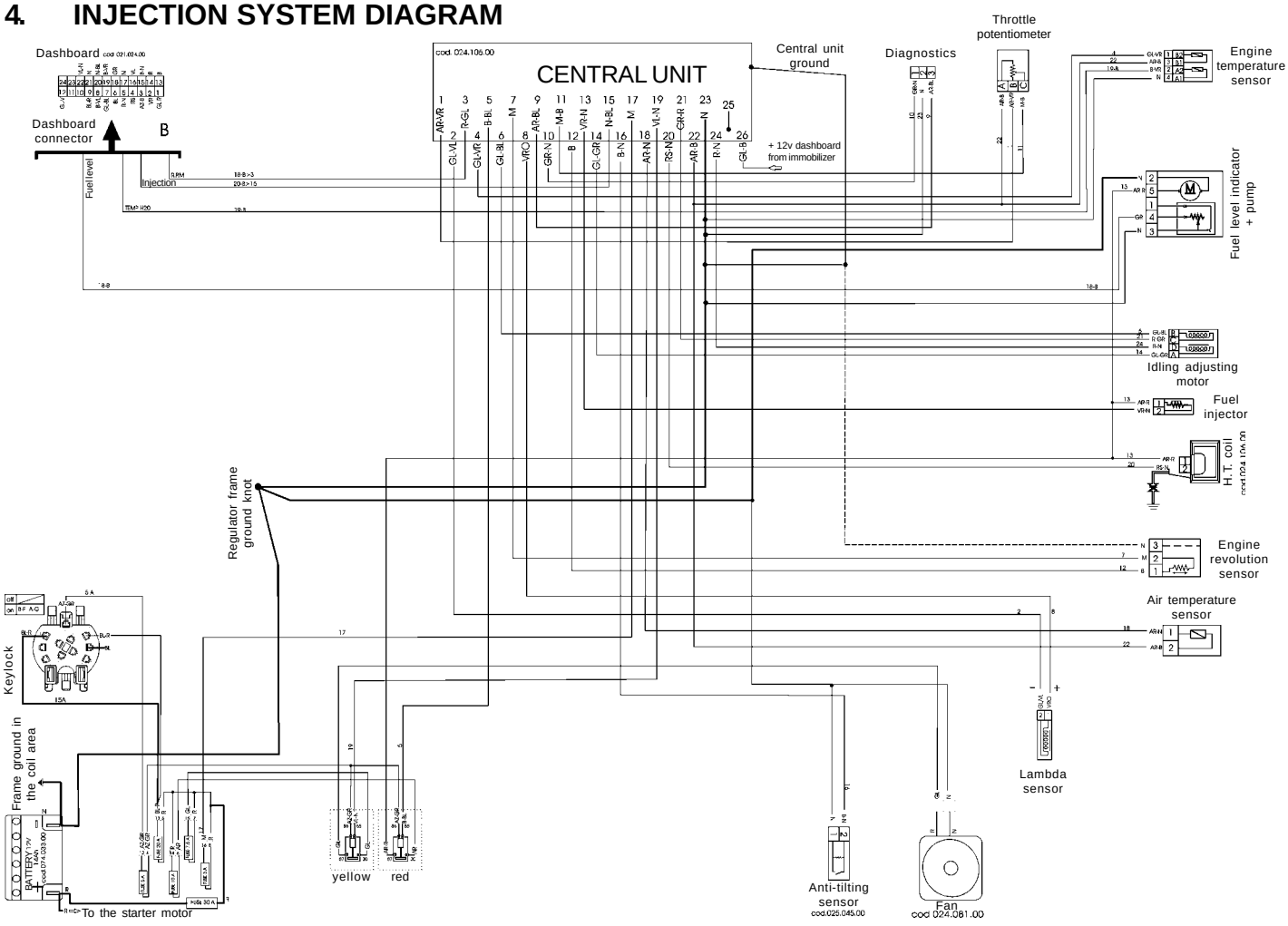
3. EMS CENTRAL UNIT TERMINAL LAYOUT

"EMS" CENTRAL UNIT	
No.	**FUNCTION**
1	THROTTLE POTENTIOMETER SUPPLY (+5V)
2	NEGATIVE - LAMBDA SENSOR
3	DIGITAL INSTRUMENT (REV. COUNTER CONTROL)
4	ENGINE TEMPERATURE (+)
5	SOLENOID STARTER OF H.T. COIL INJECTOR PUMP
6	STEPPER MOTOR
7	RPM SENSOR
8	POSITIVE - LAMBDA SENSOR
9	EMS DIAGNOSTIC CONNECTOR
10	EMS DIAGNOSTIC CONNECTOR
11	POTENTIOMETER THROTTLE SIGNAL
12	RPM SENSOR
13	INJECTOR CONTROL (NEGATIVE)
14	STEPPER MOTOR
15	INSTRUMENTATION UNIT (INJECTION LED - NEGATIVE)
16	ANTI-TILTING SENSOR (-)
17	BASIC SUPPLY (POSITIVE)
18	AIR TEMPERATURE SENSOR (+)
19	SOLENOID STARTER FAN
20	H.T. COIL (NEGATIVE CONTROL)
21	STEPPER MOTOR
22	SENSOR SUPPLY (-)
23	CENTRAL UNIT - NEGATIVE
24	STEPPER MOTOR
25	-
26	DASHBOARD SUPPLY (POSITIVE)

F. 1 Connector - Central unit side

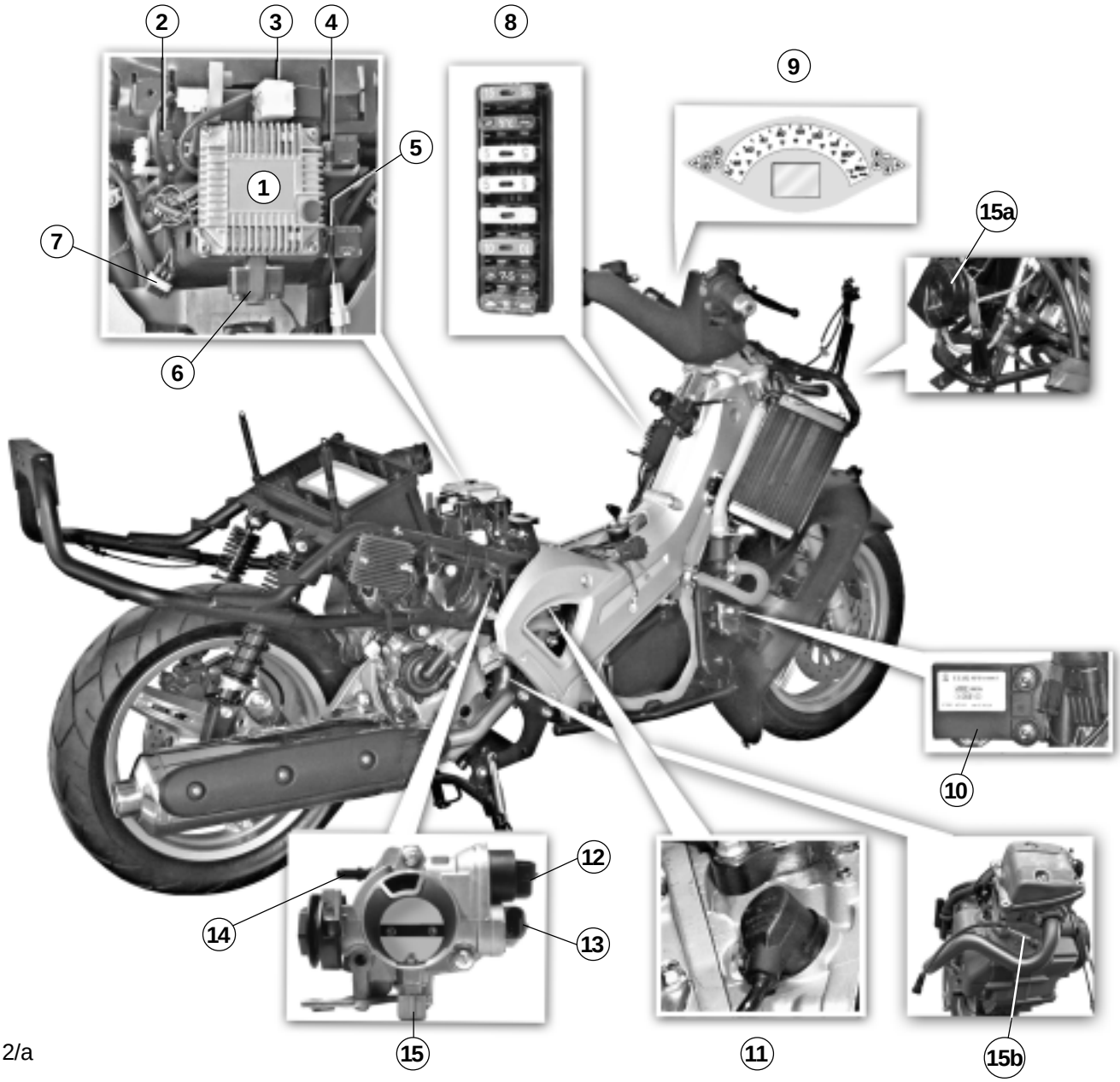
F. 2 Connector - System side

4. INJECTION SYSTEM DIAGRAM



Sch. 1

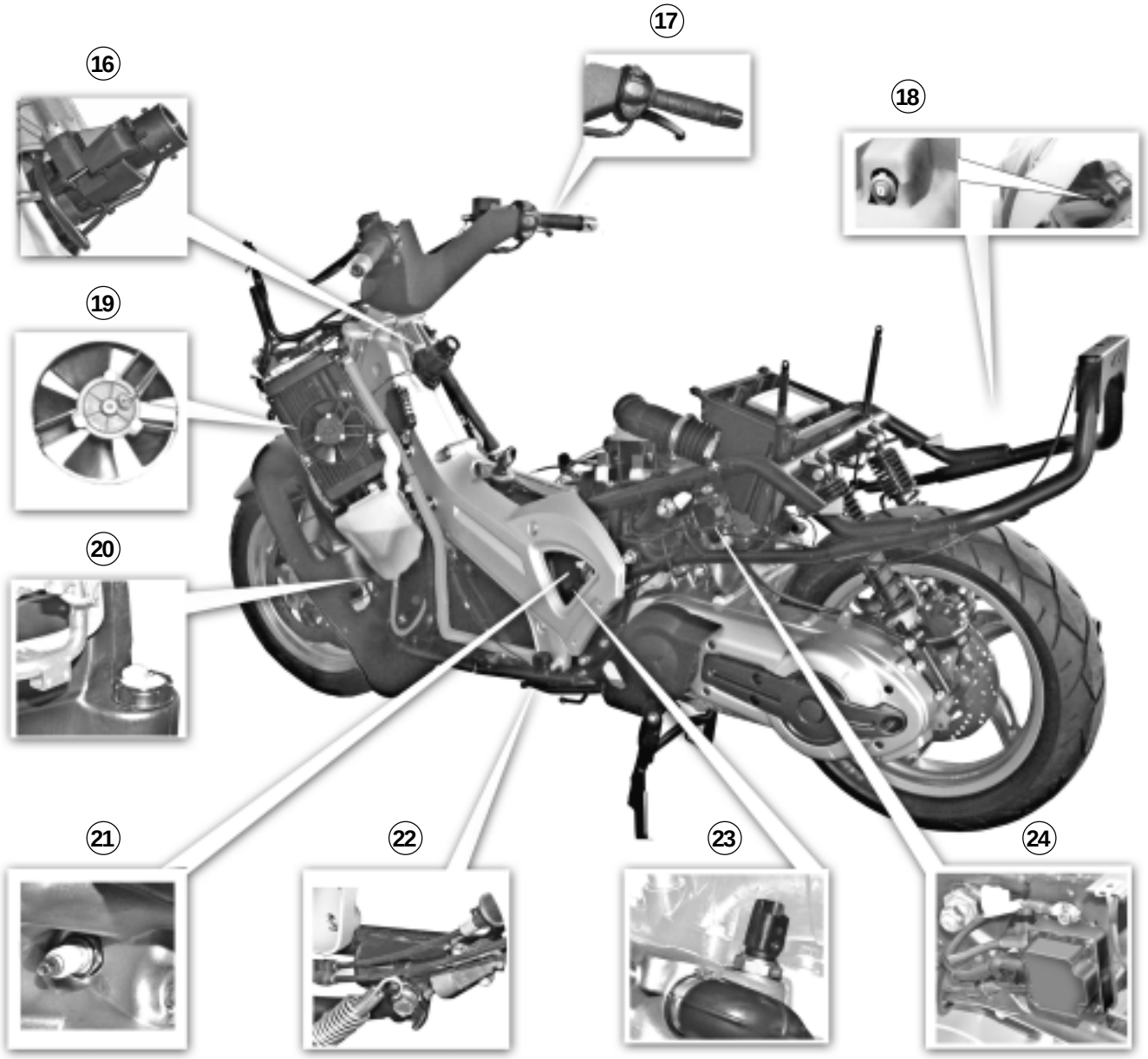
5. COMPONENT LAYOUT



F. 2/a

Right hand side

1	Injection central unit
2	Starter permissive relay
3	Fuel pump, injector, coil relays
4	Electro-valve relay
5	Starter permissive relay
6	Anti-tilting device
7	Diagnostic plug
8	Fuses
9	Dashboard
10	Immobilizer decoder
11	Rpm/speed sensor
12	Idling control stepper motor
13	Throttle potentiometer (TPS)
14	Injector
15	Intake air temperature sensor
15a	Horn
15b	Lambda sensor



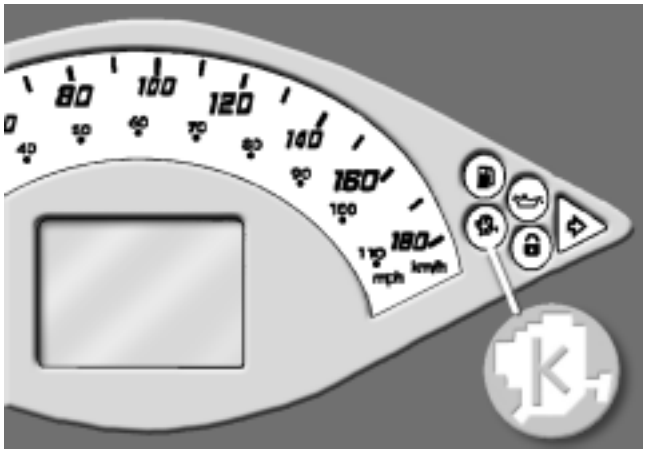
F. 2/b

Left hand side

16	Key lock with Immobilizer antenna
17	Right control
18	12V plug
19	Fan
20	Fuel pump
21	Spark plug
22	Side stand switch
23	Engine temperature sensor
24	Coil

6. GENERAL NOTES

The central unit is equipped with an autodiagnostic system connected to a led on the dashboard (letter K - F. 3).



F. 3

The EMS injection-ignition system also has a control function on the revolution counter and the radiator cooling fan.

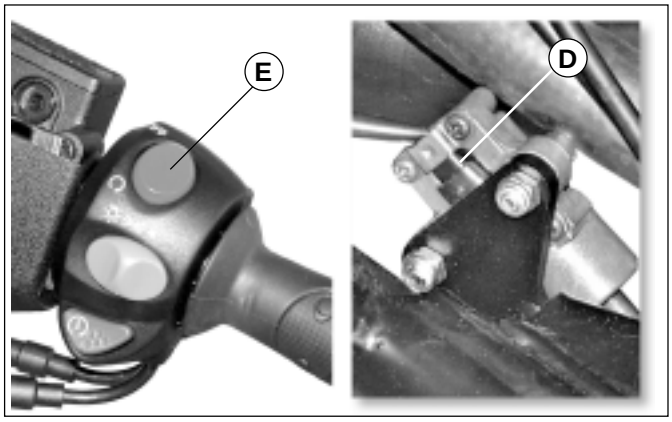
All anomalies can be detected and corrected by means of the **diagnostic multimeter** (palmar instrument) **code 08607500** (Piaggio code 020460Y).

In any case, once the anomaly is corrected it is automatically deleted from the memory after 16 cycles of use (start at cold engine, travel at warm engine, stop).

The diagnostic multimeter is fundamental also to adjust the idling carburetion.

F. 4

The EMS central unit supply is managed by the emergency switch (E) and by the side stand switch (D) to ensure a safe motorcycle operation.



F. 5

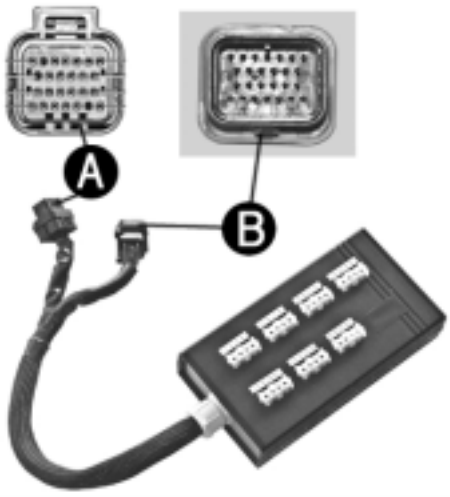
*To detect and solve any anomaly in the injection system, along with the diagnostic multimeter also use the testing wiring **(code 08607600)** (F. 6) supplied by Malaguti S.p.A.*

The above mentioned testing equipment allows carrying out any check on the EMS central unit, even when the motorcycle engine is running.

Place the testing wiring across the central unit connector and the motorcycle system connector (see F. 6).

A = System connector

B = Central unit connector

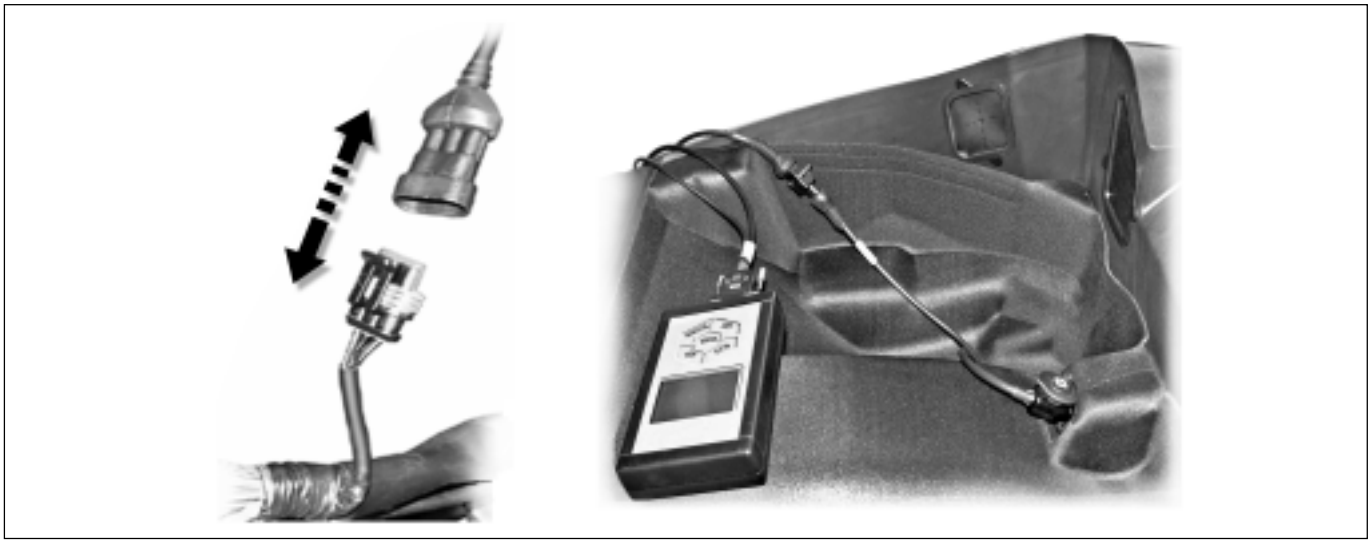


F. 6

6.1 How to use the diagnostic multimeter (code 08607500)

The EMS system diagnostic equipment (F. 4) is connected to the central unit by means of a EMS diagnostic plug located under the driver seat (F. 2/a - page 34 - component no. 7).

Remove the protection cap and connect the diagnostic multimeter terminal.



F. 7

Supply the diagnostic multimeter by connecting the terminals to the battery poles, or the specific connector to the plug located inside the helmet compartment (F. 7). Both supply cables are supplied with the motorcycle. (The system is protected against polarity inversion).

The equipment starts up whenever it is connected to the power supply (no ON/OFF button present).

The system is equipped with a display, showing all the available functions, and the following push-buttons:

ESC

OK

UP

DOWN

TAB

Press the **ESC** button to leave the function or exit the displayed menu (except the main menu).

Press the **OK** button to confirm the selection made.

Press the **UP** and **DOWN** buttons to scroll the menu **UP** and **DOWN**.

Press the **TAB** button to display the menu functions.

Every time one of the buttons is pressed a Beep is heard: it indicates that the equipment received the command.

The **DISPLAY** shows 6 lines a time: a number displayed underneath any of the 6 lines indicates the number of the function out of the total (e.g.: 1/ 7 indicates that the function displayed if the first out of the seven contained in the menu).

When starting up the equipment the **MALAGUTI** logo will be displayed.

Press any button to display the page containing all the information about the type of central unit the equipment was designed for.

Press any other button or wait for 5 seconds to access the main menu.

At this point, scroll the menu by using the UP and DOWN buttons in order to select the required sub-menu and press the OK button to access the sub-menu.

After accessing the sub-menu, select the required function and confirm by pressing the OK button again.

6.1.1 RESETTING THE ECU

In case it is necessary to replace the ECU or the throttle body, first reset the central unit.
To carry out the resetting procedure properly, follow the inStructions indicated below.

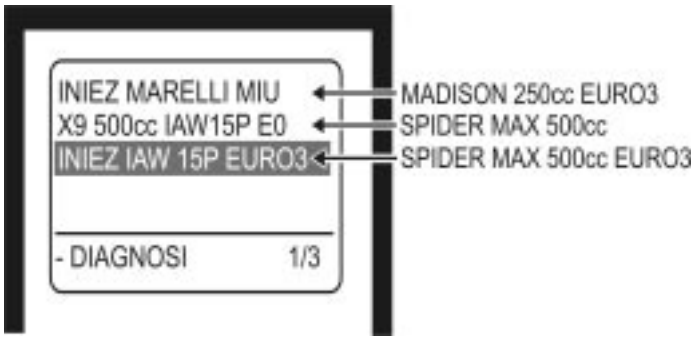
1) SELECTING THE MODEL

- Connect the diagnostic multimeter **(COD.08607500)**
  (The diagnostic multimeter allows carrying out a number of checks on the injection system of various models)
- Select the vehicle
- Press the **ESC** and **OK** keys simultaneously and hold them pressed.
- Connect the diagnostic multimeter clamps to the battery: black clamp on the negative pole, red clamp on the positive pole.

WATCH OUT NOT TO INVERT THE POLES!

- The **MAIN** menu is displayed and
  "**ECU DIAGNOSTICS**" (fig.7/a) highlighted
- Press **OK**
- The **DIAGNOSTICS** menu on the display shows the list
  of vehicles on which it is possible to carry out the interventions (fig.7/b).

F. 7/a



F. 7/b

- To move the selection bar on the required model use the **UP** (to scroll up) and the **DOWN** (to scroll down) keys.
- Press **OK**
- The model description is displayed
- **Press any key** to access the **MAIN** menu of the selected model.

2) ECU RESETTING PROCEDURE

- After selecting the required model on the diagnostic multimeter, proceed as follows:
- Move the **ENGINE STOP** switch to Start.
- Release (close) the side stand
- Turn the light switch to **OFF** (lights off)
- Turn the ignition key to **ON (without starting the engine)**
- Select the **ERROR** function
- Press **OK**
- The **ERROR** menu is displayed.
- Check for errors

a) If any error is displayed, carry out the required service intervention and delete the errors.
- Select the **DELETE ERROR** function
- Press **OK**
- The **DEL. ERROR** menu is displayed.
- Press **OK**
- Press **ESC**
- The **MAIN** menu is displayed.

b) In case no errors are displayed
- Press **ESC**
- The **MAIN** menu is displayed.

3) T.P.S. RESETTING PROCEDURE:
• Select the **T.P.S. RESETTING** function
• Press **OK**
• The **T.P.S. RESETTING** menu is displayed.
• Check the throttle stroke by means of the handgrip (make sure that, when released, the handgrip returns to zero and that the transmission has a certain play)

WARNING! In case the handgrip transmission is too tense the system acquires incorrect values on the throttle angle thus detecting errors and anomalies

• Check that the throttle is at its max. stroke
• Press **OK**
• The message **RESETTING OK, PRESS ANY KEY** is displayed, this confirms that the operation ended with success.

WARNING! THE SUCCESS OF THE T.P.S. RESETTING PROCEDURE DOES NOT MEAN THAT THE TRASMISSION FEATURES A CORRECT PLAY, IT SIMPLY CONFIRMS THAT THE ECU HAS ACQUIRED THE NEW VALUE OF THE THROTTLE STROKE.

• If everything is correct, press **OK**
• The **MAIN** menu is displayed.

4) RESETTING THE STEPPER MOTOR
• Turn the ignition key to **OFF** and wait for around 2-4 seconds
• Turn the ignition key to **ON** (with the engine off)
• Now the **stepper motor resetting** procedure is ok

• Select the **PARAMETER** function
• Press **OK**
• The **PARAMETER** menu is displayed.

Ckech that the parameters are within the tolerance values (e.g.: Throttle angle value 5.24, temperature H_20, measured outside temperature, atmospheric pressure value acquisition, T.P.S. reset on YES and Lambda sensor OPEN).

• Check that the parameters are correct
• Press **ESC**
• The **MAIN** menu is displayed.
•• Select the **ACTIVE DIAGNOSTICS** function
• Press **OK**
• The **DIAGNOSTICS** menu is displayed.
• Carry out the diagnosis on the following components:

I. **FUEL PUMP RELAY**
II. **H.T. COIL**
III. **FAN RELAY**
IV. **RPM COUNTER**

MAKE SURE THA AFTER EACH DIAGNOSTIC PROCEDURE THE MESSAGE '**TEST ENDED WITH SUCCESS, PRESS ANY KEY'** IS DISPLAYED ON THE POCKET PC

WARNING! COMPULSORY (FAN RELAY TEST).

N.B. The active diagnostics of the stepper motor can be carried out only with the engine warm and with the water temperature above 80° C.

• Make sure that all the active diagnostics ended with success
• Press **ESC**
• The **MAIN** menu is displayed.
• Select the **ERRORS** function
• Press **OK**
• The **ERRORS** menu is displayed.
• Check for errors

a) If any error is displayed, carry out the required service
  • Select the **DELETE ERRORS** function
  • Press **OK**
  • The **DEL. ERRORS** menu is displayed.
  • Press **OK**
  • Press **ESC**

b) If no error is displayed
  • Press **ESC**

• The **MAIN** menu is displayed.
• Select the **PARAMETERS** function
• Press **OK**
• The **PARAMETERS** menu is displayed.
• Start th vehicle and speed up, checking that the engine rpm are ok, wait for the coolant temperature to exceed 50° C and check the operation of beams, stop lights and other equipments.

N.B: the coolant temperature can be checked by means of the diagnosis tester

I. Select the **PARAMETERS** function
II. Press **OK**
III. The **PARAMETERS** menu is displayed.
IV. Check the **WATER TEMPERATURE** value

Make sure that the value measured by the diagnostics multimeter (**WATER TEMP.**) is the same indicated on the scooter digital dashboard by the **W Temp** (the second segment of the graphic bar must be displayed).
If the fuel pump has not refilled or during the active diagnostics the air was not bleeded completely from the supply system, it is necessary to carry out the fuel pump check several times.
To perform the pump check, turn the ignition key from **ON** to **OFF.**
In case the battery is low (but the current allows starting the vehicle) the engine idle speed may be quite irregular and errors may be detected.
Leave the engine idling for at least 30 seconds in order to allow the system to carry out the self adaptation.

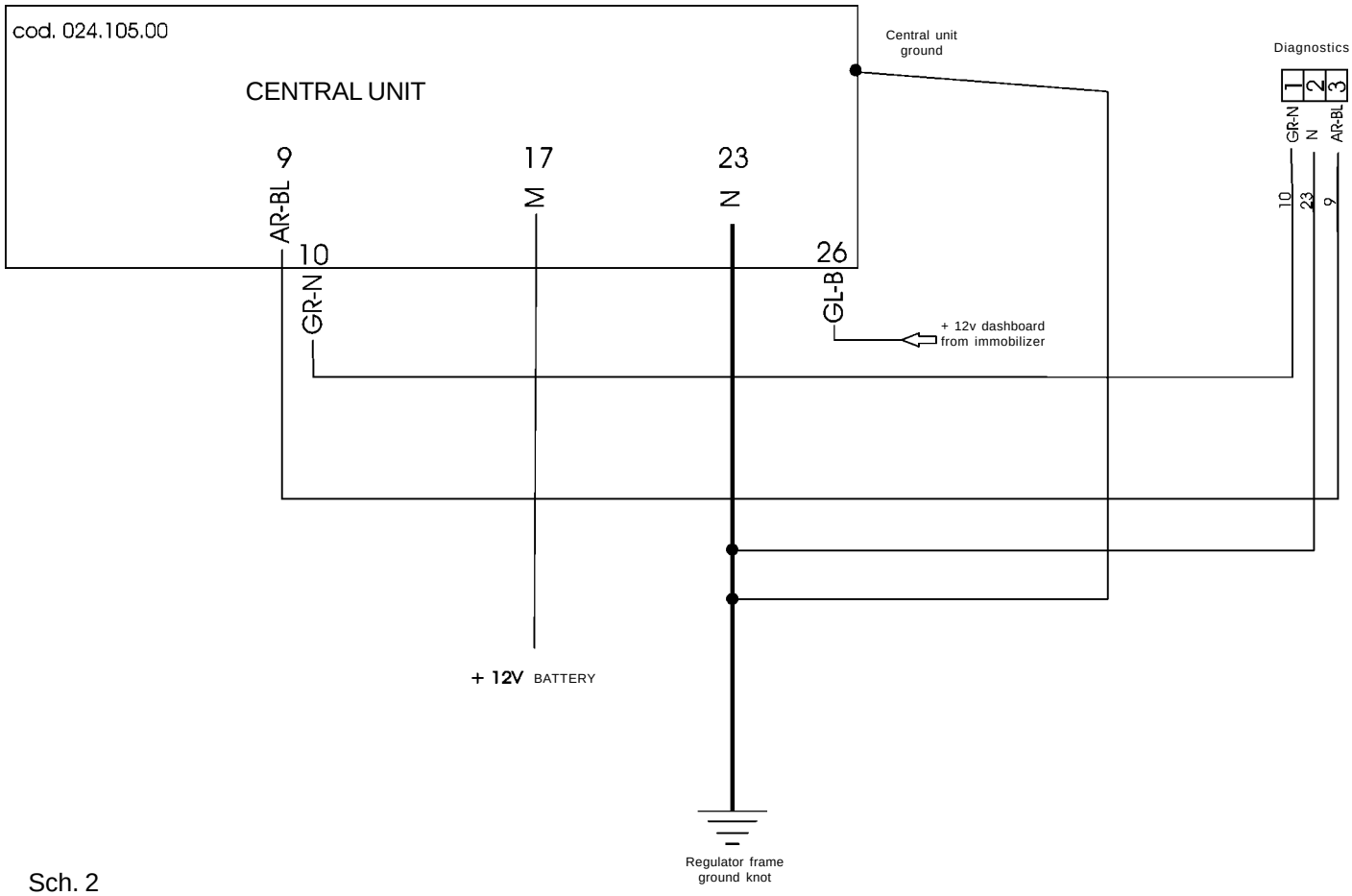
WARNING! Do not carry out any operation on the scooter components during this phase.
During self-adaptation, check the lambda sensor operation by making sure that **LAMBDA STATUS IS CLOSED** (the loop on the reading must be closed) on the diagnostics sensor multimeter and the parameter **ENGINE RPM (RPM)** is around 1500 g/min-1.
It is now possible to carry out the **STEPPER MOTOR** diagnostics **(checking that the coolant temperature has reached 80°C).**

WARNING! In case the **CLOSED LOOP (0)** is not displayed on the **ADATT.TIT.OFFSET** parameter, take note of all the errors active or stored on the pocket pc, then reset the system and carry out the check once again.

• Turn the ignition key to **OFF**

WARNING! Wait for at least 30 seconds with the key on **OFF** before disconnecting, in the following order, the diagnostics connector and, if necessary, the battery.
Leaving the key on **OFF** for 30 seconds in order to write in eeprom all the data of the routing just ended (errors, self-adaptation values....).

6.2 Circuit diagram diagnostic plug



Sch. 2

6.3 Connection circuit check of the “Diagnostic multimeter”

• In case the message “**central unit is not responding**” is displayed on the **diagnostic multimeter**, cut the dashboard supply for 10 seconds and then switch it ON again. If the warning message persists follow the instructions indicated below:

Check the diagnostic multimeter connectors and wiring:
A) Diagnostic plug
B) 12 Volt supply plug

F. 8

OK

Check the central unit and dashboard supply.
(See paragraph 9.1 - page 50 - paragraph 9.2 - page 52).

NO

Restore connectors and/or wiring.

OK

Connect the **testing wiring (code 08607600)** to the motorcycle system connector leaving the **EMS central unit disconnected**.

F. 9

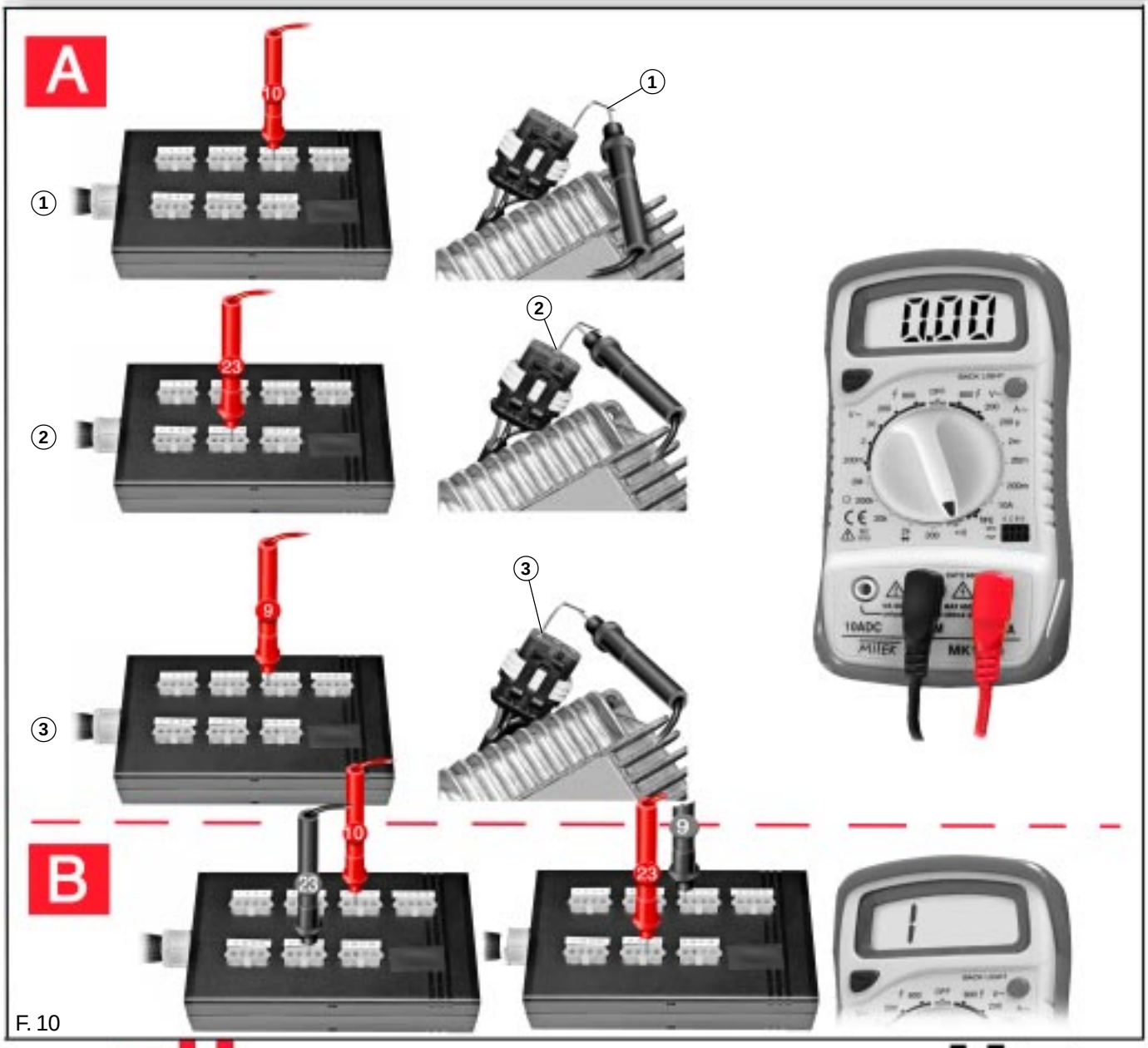
Verify the following conditions:

A

PIN 1 diagnostic plug **- PIN 10** central unit = continuity
PIN 2 diagnostic plug **- PIN 23** central unit = continuity to ground
PIN 3 diagnostic plug **- PIN 9** central unit = continuity

B

PIN 10 - PIN 23 = insulation (> 1MΩ)
PIN 9 - **PIN 23** = insulation (> 1MΩ)



F. 10

OK

Replace the central unit

NO

Remove the interruption or short circuit cause

7. TROUBLESHOOTING

7.1 Troubleshooting - tips

NOTE *- A system failure concerning the EMS system may be more likely caused by faulty connections rather than faulty components.*
Before checking the EMS system for anomalies, carry out the following verifications:

A. Electrical supply
- Battery voltage
- Burnt out fuse
- Solenoid starters
- Connectors

B. Ground to chassis

C. Fuel supply
- Faulty fuel pump
- Dirty fuel filter

D. Ignition system
- Faulty spark plug
- Faulty coil
- Faulty shielded cap

E. Intake circuit
- Dirty air cleaner
- Dirty by-pass circuit
- Faulty stepper motor

F. Other
- Incorrect timing
- Incorrect idling carburetion
- Incorrect gas valve position sensor reset

NOTE *- Most EMS system anomalies are caused by loose connectors. Make sure that all connections are properly done.*

Check connectors, taking special care to the following points:

1. check the terminals for bents.
2. check the connectors for proper plug in.
3. cause a slight vibration to the connector and verify whether the anomaly changes in any way.

Before replacing the EMS central unit, check for the whole system operation.
In case the anomaly disappears after replacing the EMS central unit, fit the previous central unit back and verify whether the problems persists.

Use a multimeter with an inner resistance > 10KΩ for troubleshooting.
An improper equipment may damage the EMS central unit.
We suggest to chose equipments with a resolution above 0,1V and 0,5Ω. Resolution should always be above ± 2%.

8. TROUBLESHOOTING PROCEDURES

8.1 The engine does not start up even dragging the motorcycle.

Anomaly	Verifications
Immobilizer permissive	System not coded.
	System failure. Repair according to instructions.
Anomalies detected by the injection autodiagnostic system	Pump relay
	H.T. coil
	Injector
	Rpm / speed sensor
Fuel supply	Fuel level in the tank
	Fuel pump start up
	(low) fuel pressure
	(Low) injector flow
Spark plug supply	H.T. coil shielded cap spark plug (secondary insulation)
End of compression pressure	
Parameter reliability	Coolant temperature
	Timing - ignition injection
	Intake air temperature

8.2 Difficult start up at cold and/or warm engine

Anomaly	Verifications
Anomalies detected by the injection autodiagnostic system	Pump relay
	H.T. coil
	Injector
	Rpm/ speed sensor
	Air temperature
	Coolant temperature
	Atmospheric pressure
Start up speed	Starter motor and solenoid starter
	Battery
	Ground cables
End of compression pressure	
Spark plug supply	Spark plug
	Shielded cap
	H.T. coil
	Rpm/speed sensor
	Spark advance
Fuel supply	(Low) fuel pressure
	(Low) injector flow
	(Unsufficient) injector sealing
Parameter reliability	Coolant temperature
	Intake air temperature
	Gas valve position
	Stepper motor (steps and opening)
	Secondary air duct and gas valve cleaning
	Air cleaner efficiency

8.3 The engine stops when idling / Unstable idling speed / Idling speed too low

Anomaly	Verifications
Anomalies detected by the injection autodiagnostic system	Pump relay
	H.T. coil
	Injector
	Rpm/speed sensor
	Air temperature
	Coolant temperature
	Atmospheric pressure
Ignition operation	Spark plug
	Ignition timing
Parameter reliability	Gas valve position sensor
	Stepper motor
	Coolant temperature sensor
	Intake air temperature sensor
Intake system cleaning	Air cleaner
	Gas choke and valve
	Secondary air duct and stepper motor
Intake system sealing (leaks)	Intake manifold - head
	Throttle body - manifold
	Intake hose
	Airbox
Fuel supply (low pressure)	Fuel pump
	Pressure regulator
	Fuel filter
	Injector flow
Analysis of exhaust gas before the catalytic converter	Trimmer value adjustment (CO % adjustment)

8.4 The engine does not get back to the idling speed / Idling speed too high

Anomaly	Verifications
Anomalies detected by the injection autodiagnostic system	Pump relay
	H.T. coil
	Injector
	Rpm/speed sensor
	Air temperature
	Coolant temperature
	Atmospheric pressure
Ignition efficiency	Ignition timing
Parameter reliability	Gas valve position sensor
	Stepper motor
	Coolant temperature sensor
	Intake air temperature sensor
Intake system sealing (leaks)	Intake manifold - head
	Throttle body - manifold
	Intake hose
	Airbox
Fuel supply (low pressure)	Fuel pump
	Pressure regulator
	Fuel filter
	Injector flow
Analysis of exhaust gas before the catalytic converter	Trimmer value adjustment (CO % adjustment)

8.5 Chugging during deceleration

Anomaly	Verifications
Anomalies detected by the injection autodiagnostic system	Pump relay
	H.T. coil
	Injector
	Rpm/speed sensor
	Air temperature
	Coolant temperature
	Atmospheric pressure
Parameter reliability	Gas valve position sensor
	Stepper motor
	Coolant temperature sensor
	Intake air temperature sensor
Intake system sealing (leaks)	Intake manifold - head
	Throttle body - manifold
	Intake hose
	Airbox
Fuel supply (low pressure)	Fuel pump
	Pressure regulator
	Fuel filter
	Injector flow
Exhaust system sealing (leaks)	Manifold - head
	Manifold - silencer
	Analyser plug
	Silencer welding
Analysis of exhaust gas before the catalytic converter	Trimmer value adjustment (CO % adjustment)

8.6 Irregular engine operation when the gas valve slightly open

Anomaly	Verifications
Anomalies detected by the injection autodiagnostic system	Pump relay
	H.T. coil
	Injector
	Rpm/speed sensor
	Air temperature
	Coolant temperature
	Atmospheric pressure
Intake system cleaning	Air cleaner
	Gas valve and choke
	Secondary air duct and stepper motor
Intake system sealing	Intake hose
	Airbox
Ignition system	Check the spark plug for wear
Parameter reliability	Gas valve position signal
	Coolant temperature signal
	Intake air temperature signal
	Spark advance
TPS reset ended with success	
Analysis of exhaust gas before the catalytic converter	Trimmer value adjustment (CO % adjustment)

8.7 Loss of engine power at maximum rpm/ Irregular engine operation during acceleration

Anomaly	Verifications
Anomalies detected by the injection autodiagnostic system	Pump relay
	H.T. coil
	Injector
	Rpm/speed sensor
	Air temperature
	Coolant temperature
	Atmospheric pressure
Spark plug supply	Spark plug
	Shielded cap
	H.T. cable
	H.T. coil
Intake system	Air filter
	Airbox (sealing)
	Intake hose (sealing)
Parameter reliability	Gas valve position signal
	Coolant temperature signal
	Intake air temperature signal
	Spark advance
Fuel supply	Fuel level
	Fuel pressure
	Fuel filter
	Injector flow

8.8 Detonation (Knocking)

Anomaly	Verifications
Anomalies detected by the injection autodiagnostic system	Pump relay
	H.T. coil
	Injector
	Rpm/speed sensor
	Air temperature
	Coolant temperature
	Atmospheric pressure
Ignition operation	Spark plug
Parameter reliability	Gas valve position signal
	Coolant temperature signal
	Intake air temperature signal
	Spark advance
Intake system sealing	Intake hose
	Airbox
TPS reset ended with success	
Fuel supply	Fuel pressure
	Fuel filter
	Injector flow
	Fuel quality
Cylinder base gasket thickness selection	

9. INJECTION CENTRAL UNIT SUPPLY CIRCUIT

9.1 Constant power supply circuit check (12V – with the key on the "OFF" position)

The injection central unit supply is important in order to control the stepper motor.
Failure in the supply prevents both ignition and injection.
In case a problem in the central unit occurs, the diagnostic multimeter generates the following warning message:
"CENTRAL UNIT IS NOT RESPONDING".

Perform the check as follows:

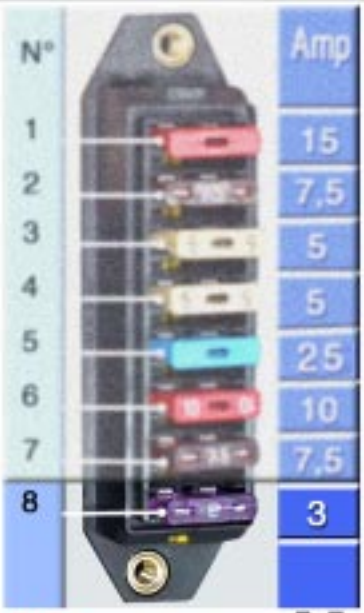
- Lift the side stand.
- Position the key switch on the "ON" position.
- Position the emergency switch on "RUN".
- Verify whether the injection led flashes for 5 seconds.

NO → Check digital instrument and supply.

OK

OK → The injection central unit is receiving power

NO → Check the 3A no. 8 fuse operation.



NO

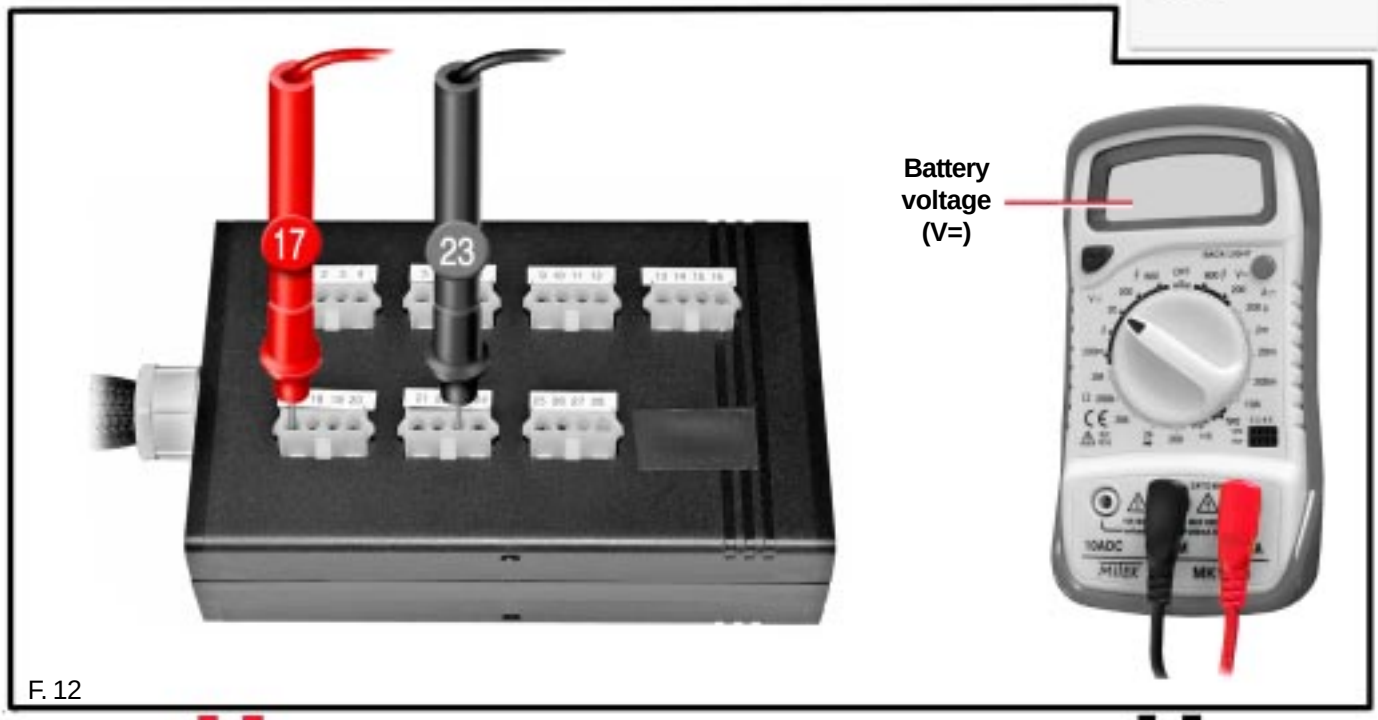
OK → Remove the short circuit cause and replace the fuse.

F. 11

OK

Make sure the central unit is receiving power by means of the **testing wiring (code 08607600)**

PIN 17 - battery positive pole
PIN 23 - battery negative pole



F. 12

OK

The central unit is receiving power supply

NO

A - **The negative pole is missing (PIN 23)**: check the ground connectors and wiring and to the central unit connector.
B - **The positive pole is missing**: find the **brown cable** interruption across the **3A** fuse carrier and the central unit connector **(PIN 17)**.

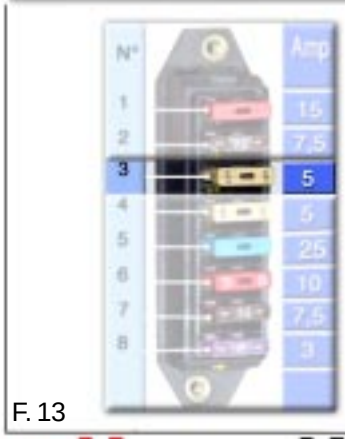
9.2 Check the circuit power supply coming from the key switch.

Power failure to the dashboard prevents both ignition and injection.
Power failure prevents both ignition and injection.
In case a problem in the central unit occurs, the diagnostic multimeter **generates the following warning message**: **“CENTRAL UNIT IS NOT RESPONDING”.**
Perform the check as follows:

- Lift the side stand.
- Position the key switch on the “ON” position.
- Position the emergency switch on “RUN”.
- Verify whether the injection led flashes for 5 seconds.

OK → The dashboard is receiving power supply.

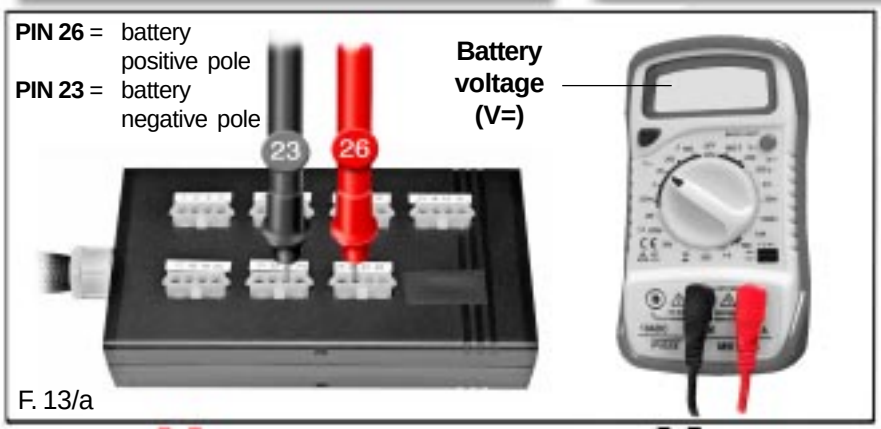
NO → Check the 5A no. 3 fuse operation.



F. 13

OK → Check whether the central unit dashboard is receiving power by means of the **testing wiring.** Move the key switch to the “ON” position, the emergency switch to “RUN” and lift the side stand.

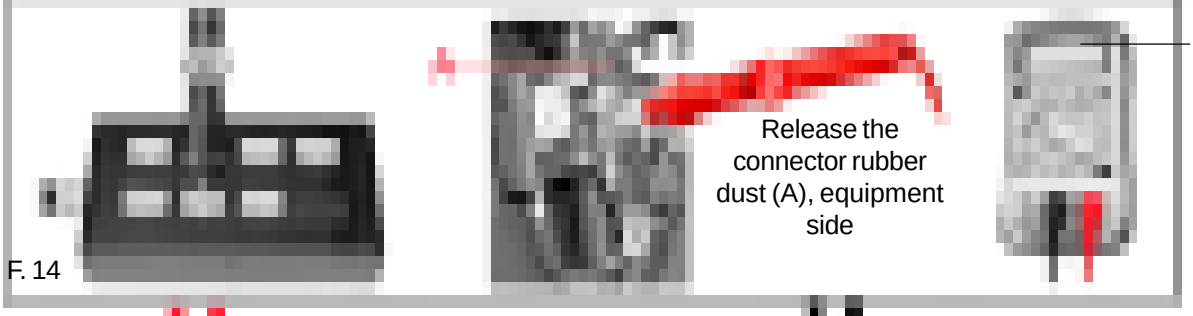
NO → Remove the cause of the possible short circuit, replace the fuse and then check the immobilizer and the central unit operation.



F. 13/a

Correct central unit dashboard supply

Check the input voltage to the immobilizer: **PIN 2** connector, equipment side (**yellow/green** cable)
- Position the key switch on the “ON” position.
- Position the emergency switch on “RUN”.
- Lift the side stand.



F. 14

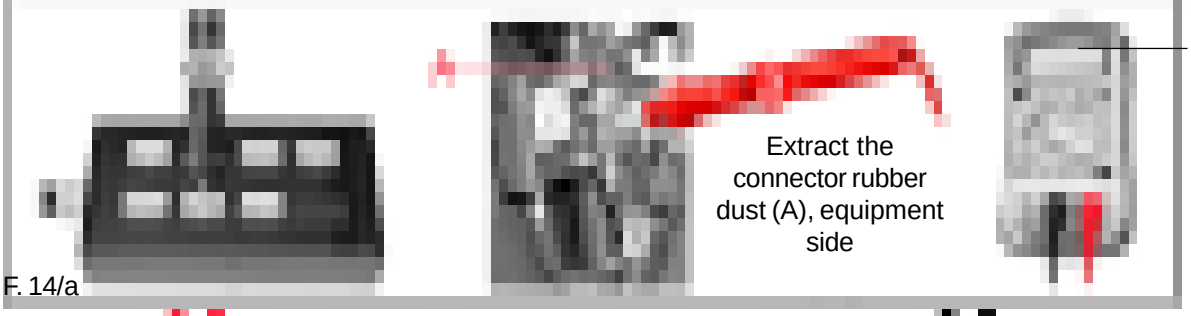
Check the following connections:
A) key switch → emergency switch;
B) emergency switch → side stand switch;
C) side stand switch → Immobilizer.

Always refer to the electrical diagram when performing the above described checks.

NOTE - *The system operation can also be checked by means of:*
- signal of engine start-up failure
- starter control operation

Restore the system or replace the faulty component.

Check the input voltage to the immobilizer: **PIN 3,** connector, equipment side (**yellow/white** cable)
- Position the key switch on the “ON” position.
- Position the emergency switch on “RUN”.
- Lift the side stand.



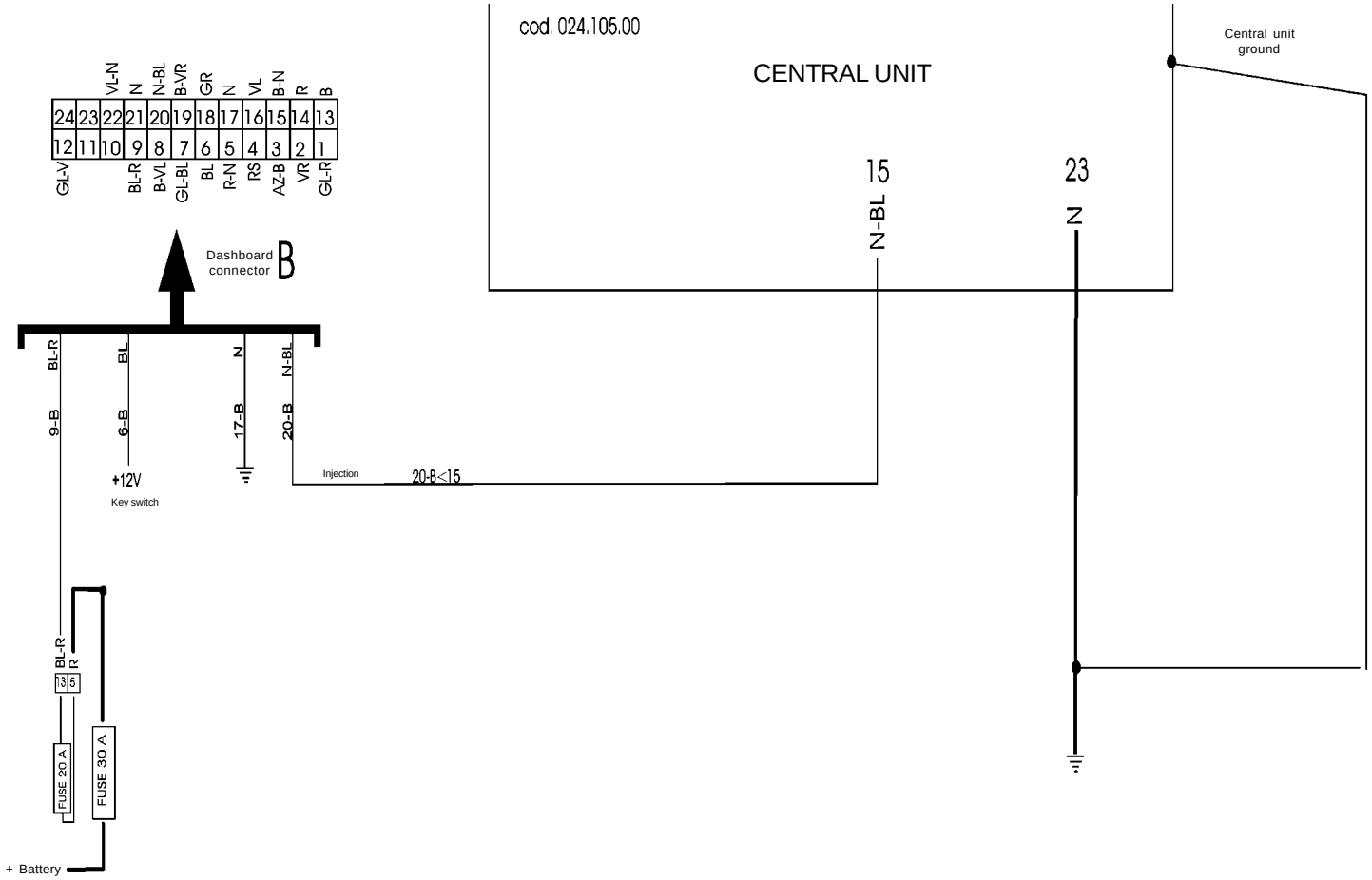
F. 14/a

Find the interruption of the **yellow/white** cable and repair it (see electrical diagram).

Replace the immobilizer.
Store the keys (see paragraph 18.1 - p. 24).

10. INJECTION LED CIRCUIT

10.1 Circuit diagram



Sch. 3

Every time the key switched is moved to the “ON” position, the injection led receives the command and blinks for 5 seconds.

The diagnostic multimeter is not programmed to perform a check of the circuit.
Proceed as follows:

- Key switch on the “ON” position;
- Lift the side stand;
- Emergency switch on “RUN”
- **The injection led goes on for 5 seconds.**

OK → The system is working.

NO → Connect the t**esting wiring** across the system and the central unit.

Disconnect the dashboard connector.
Check the **blue/black cable for** interruptions between the dashboard connector (**PIN 20**) and the **checking wiring 15 PIN**.

F. 15

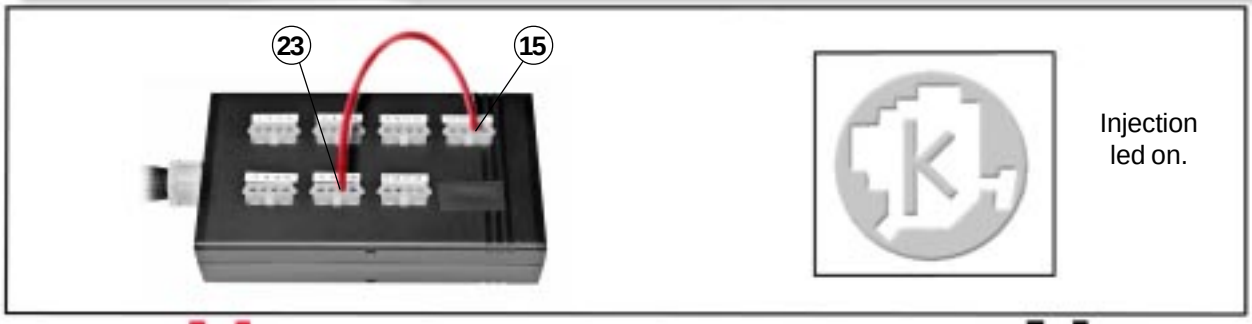
NO

Repair the **blue/black cable** interruption across central unit and dashboard.

OK

Disconnect the testing wiring connector from the central unit.
Connect the dashboard connector.

Create a bridge across **PIN 15** and **PIN 23**.



Injection led on.

OK

Replace the central unit.

NO

Replace the dashboard.

NOTE *- The injection central unit controls the negative pole of the led. The led must turns off after the initial check and turn on again when the central unit autodiagnostic system detects any anomaly. When the anomaly is repaired the led switches off again. In any case, it is necessary to perform the operation checks. The led can switch on even when the engine is not operating.*

11. AUTODIAGNOSTIC SYSTEM

The injection central unit is equipped with an autodiagnostic function.

In case an anomaly is detected, the central unit:
- switches the injection led on (only when present).
- performs a check of the engine management on the basis of the data contained in the central unit (when possible).
- stores the anomaly (always).

In case the anomaly is not continuous, the led follows the anomaly recurrence and the storage function remains on. The anomaly is automatically deleted from the memory when it does not recur for more than 16 cycles of use of the motorcycle (heating- use- cooling down). The data stored are not deleted when the battery is disconnected.

11.1 Stored anomaly check

Connect the diagnostic multimeter to the motorcycle system.
Select the menu from the ”ERRORS” function (see paragraph 6.1 - p. 37).

F. 16

Parameters
Immobilizer
Errors
Delete errors
Active diagnostics
CO calibration
Main 3/8

The multimeter pages contain the list of errors that can be detected by the autodiagnostic system. The errors detected by the autodiagnostic system are indicated by one or two reference dots.

The dots are positioned on two lines:
Line A = current (present) anomalies
Line M = stored anomalies

F. 16/a

Coil • •
Stepper motor
Pump relay
Fan
Auto-adaptation parameters
RAM memory
Errors 2/3 A M

The errors that can be detected by the autodiagnostic system may concern the following system circuits or central unit sections:
- throttle valve position signal;
- room pressure signal;
- coolant temperature signal;
- Intake air temperature signal;
- Incorrect battery voltage;
- **Injector and corresponding circuit;**
- **H.T. coil and corresponding circuit**;
- Stepper motor and corresponding circuit;
- **pump relay circuit;**
- Fan relay circuit;
- RAM memory;
- ROM memory;
- EEPROM;
- Microprocessor
- **Signal panel (signal for engine rpm - speed - unstable cycle).**

The underlined anomalies always cause the engine to stop.
In all other cases, the engine continues running, managed by the data bases.

11.2 Deletion of stored anomalies

After correcting the anomaly connect the diagnostic multimeter.
Select the menu from the ”DELETE ERRORS” function.
Press OK and follow the instructions.

After a test race, check for the anomaly recurrence.

For troubleshooting guide, refer to the corresponding chapter sections.

F. 16/b

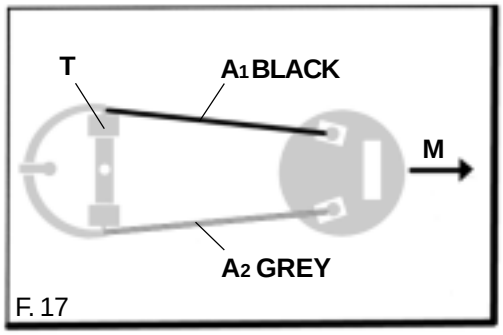
Parameters
Immobilizer
Errors
Delete errors
Active diagnostics
CO calibration
Main 4/8

12. FUEL SUPPLY SYSTEM

General data
The supply of fuel to the injector is ensured by means of a pump, a filter and a pressure regulator integrated with the fuel level indicator located inside the tank.

The pump unit is connected to the injector by means of:
- 2 semi-rigid hoses - **(A1 = outlet) - (A2 = inlet);**
- 4 quick couplings;
- 1 T-coupling with O-ring and injector locking bracket;
- M = Motion direction

The hoses are crossed and ensured to the intake manifold in order to prevent an excessive wearing of the quick couplings to the injector T-coupling.



F. 17

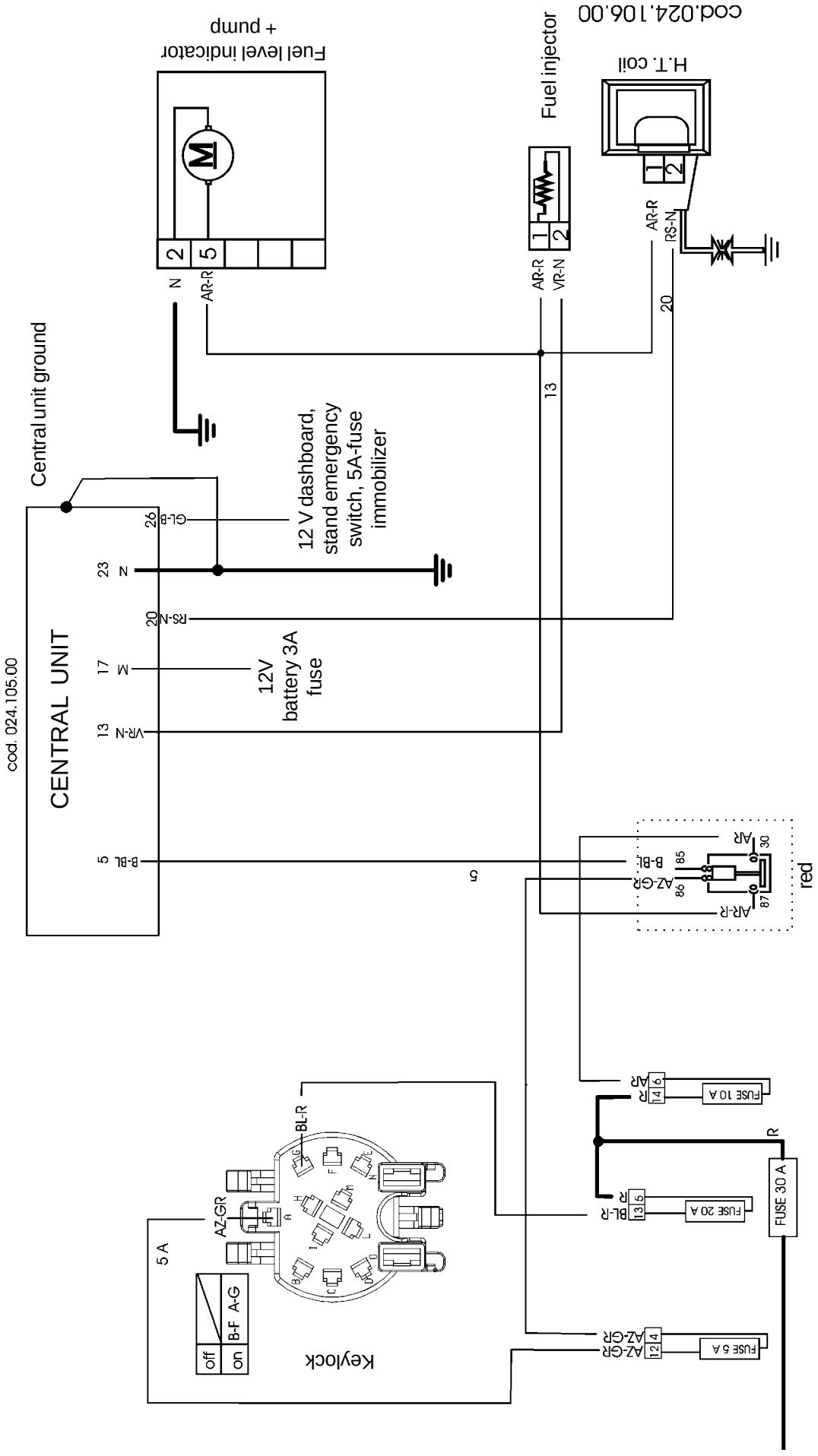
Before any intervention on the supply system, carefully clean all the components in order to avoid damaging the quick coupling sealing or causing any impurity to sip into the ducts.

The system is pressurised.
Do not smoke when performing the mentioned operations.
Try to prevent the fuel from splashing.

Precautions
- Before starting the engine, make sure the tank contains fuel.
- Do not use the motorcycle when the reserve fuel has been used for a long time, you may run out of fuel.
- In case the motorcycle is not used for a long time, refill the tank at least up to its half.

FAILURE TO OBSERVE THESE RULE MAY DAMAGE THE PUMP.

12.1 Circuit diagram



Sch. 4

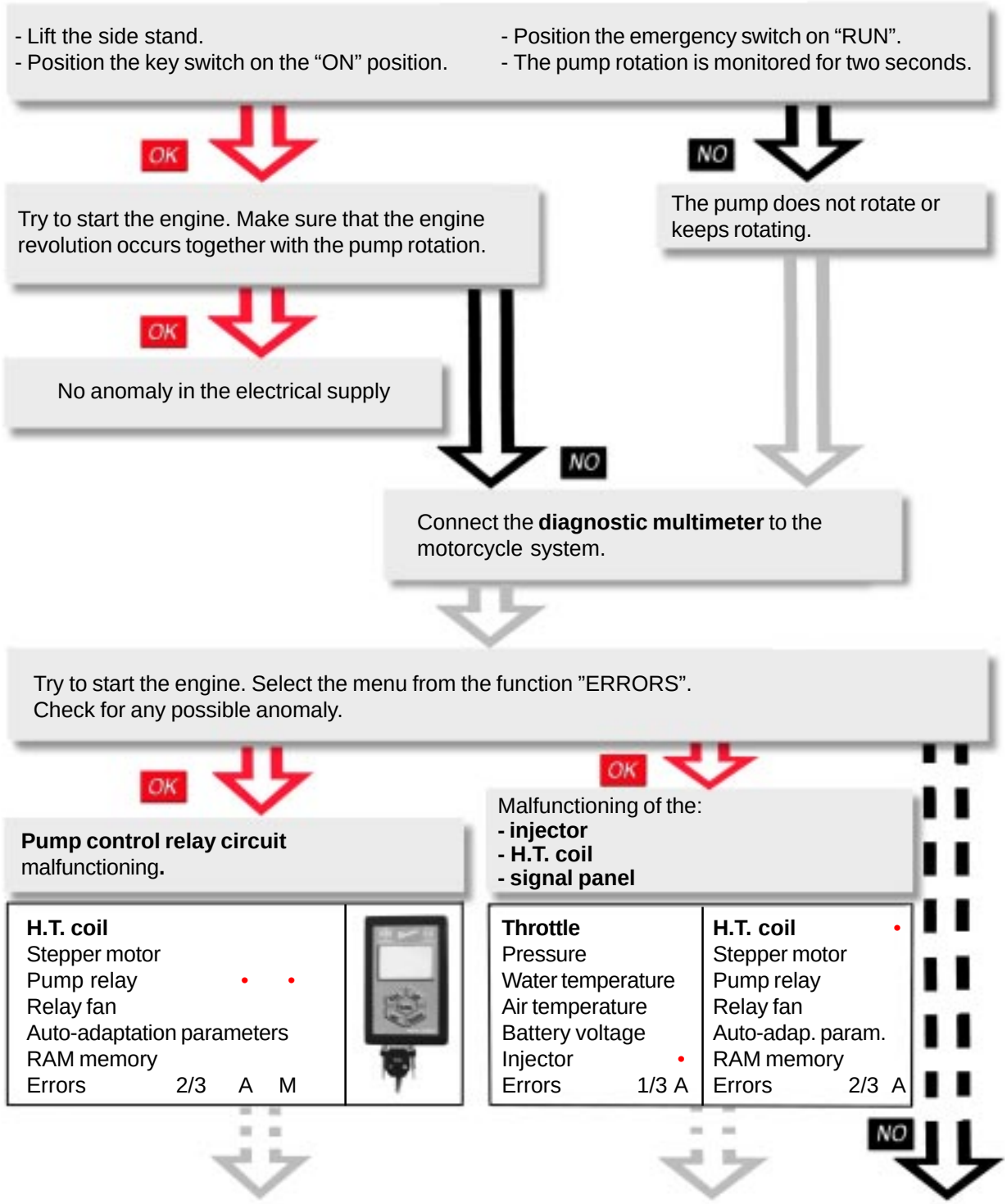
12.2 Pump supply circuit

The central unit controls the pump operation when the following conditions occur:
- move the key switch to the “ON” position and the emergency switch on “RUN” and lift the side stand. The pump is supplied for 2 seconds.
- when the engine rpm/ speed signal is on.
  Continuous supply.

The initial time is necessary to bleed the system, especially in case of a stop at warm engine.
In these conditions, the fuel, modified by the boiling is mixed with the fuel contained in the tank.
During the motorcycle use, the pump operation is subordinate to the motor revolution.

12.3 Circuit check

Follow the above instructions to check the circuit:



The central unit detected an anomaly on the **PIN 5 line (blue/white cable).**

OK

Grounded line. In this case, the pump always rotates when the dashboard is supplied.

White/Blue cable is grounded across the **central unit PIN 5 and the red relay PIN 85.**

Restore insulation from ground of **line 5 - 85** and start the verification procedure from the beginning.

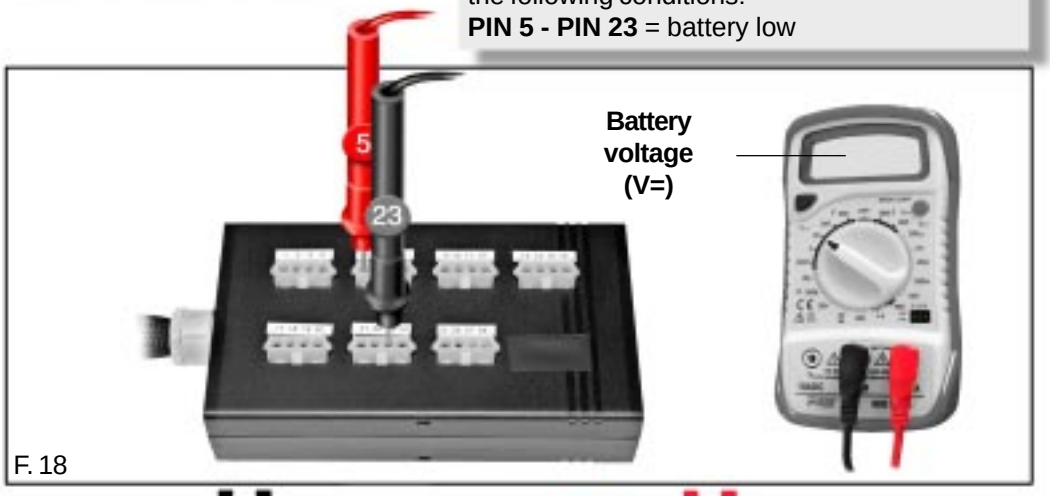
OK

Line interrupted. The relay cannot control the pump supply.

Install the **testing wiring across** the central unit and the system.

- Lift the side stand.
- Position the key switch on the “ON” position.
- Position the emergency switch on “RUN”.

Wait for more than two seconds and check the following conditions:
PIN 5 - PIN 23 = battery low



F. 18

NO

Check:
A) the continuity of the fair blue/gray cable across the red relay **PIN 86** and the fuse carrier no. 4 (5A).
B) continuity of the white/blue cable across the red relay **PIN 85** and the central unit **PIN 5**.

OK

Replace the central unit.

NO

OK

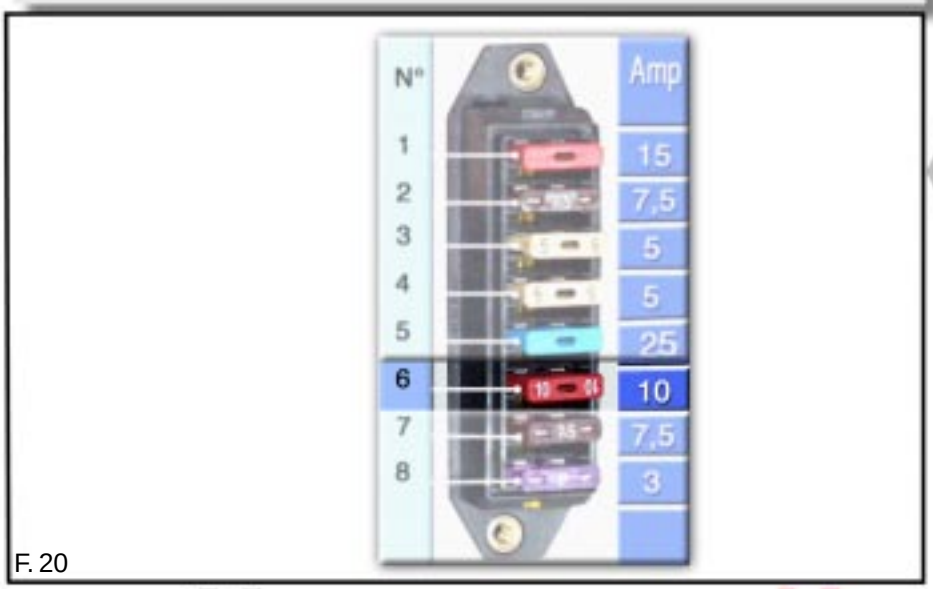
Check the **red relay** resistance.

PIN 86 = FAIR BLUE/GRAY
PIN 85 = WHITE/BLUE

PIN 85 - 86 = 100 ± 50 Ω.

F. 19

Check for the 10A fuse no. 6 operation.



F. 20

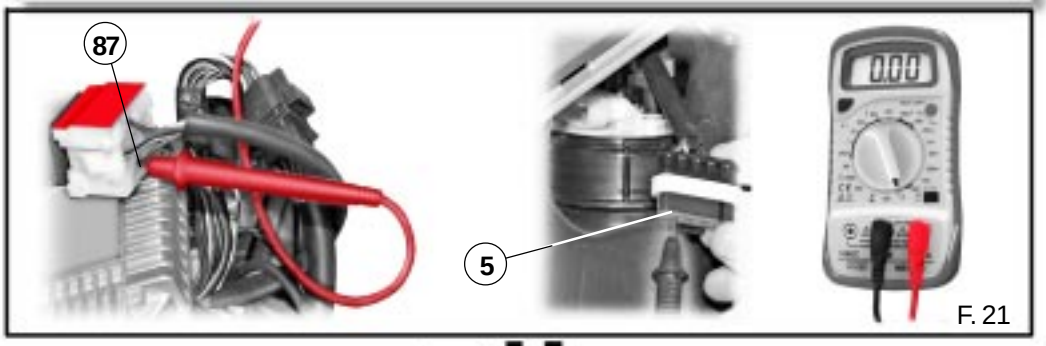
NO

OK

NO

OK

Disconnect the fuel pump connector.
A - Check for the **red relay** operation **= 100 ± 50 Ω** (F. 19 - P. 65).
B - Check the continuity of the **orange/red cable**, across the red relay **PIN 87** and the **fuel pump PIN 5**.



F. 21

NO

NO

Disconnect the fuel pump connectors, the H.T. coil and the injector.

A - Not within the indicated values: replace the red relay.
B - Repair the interruption of the **orange/red cable** and repeat the verification from the beginning.

- Install the **testing wiring** across the central unit and the system.
- Check that the **orange/red** cable is insulated from the ground across the **PIN 87** (**red relay**) and the **PIN 23** (central unit) = insulation (>1 **M Ω**).

F. 22

NO

OK

Orange/red cable in short circuit. Restore the cable insulation and replace the 10 A fuse no. 6.

Check for the H.T. coil and the injector (see the coil and injector sections) insulation from ground.

OK

NO

OK

Check for the pump winding resistance: **≥ 1,5 Ω** (see p. 75).

OK

Replace the fuse and check for the pump operation.

NO

Check the power consumption (see page 75).

Select the diagnostic multimeter menu from the "ACTIVE DIAGNOSTICS" function. Select the "fuel pump simulation" function. Enable the function with the dashboard supply function on and the engine not running.

NO

Parameters		**Fuel pump relay**		**Carrying out diagnostic check Please wait**
Immobilizer		H.T. coil		
Errors		Stepper motor		
Delete errors		Rev. counter		
Active diagnostics		Injector		
CO calibration		Relay fan		
Main	5/8	Diagnostic check	1/6	Fuel pump relay

The multimeter prompts the central unit to enable the pump for 30 seconds.

Make sure the sound of the following operation can be heard:
- relay closing
- pump rotation
- relay opening

OK

The pump is receiving supply. Check the pump operation (see p. 68).

NO

Check the connector to the pump support.

OK

Replace the pump (see p. 76)

NO

Restore

12.4 Hydraulic check and supply system maintenance

Before carrying out the checks concerning the system pressure, we suggest to clean the supply system components carefully.
In order to perform these checks a **specific tool** is required:
fuel pressure check kit.
(Malaguti code: 08607400)
(Piaggio code: 020480Y)

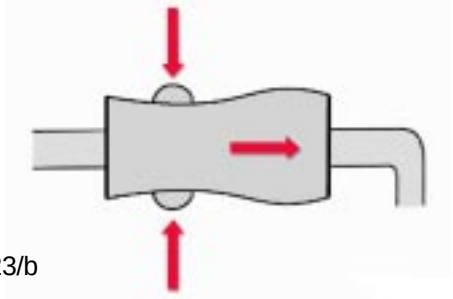
F. 23

Before disassemble any of the quick coupling, reduce the system pressure.
Disconnect the electrical connector from the pump support while the engine is rotating and wait for the it to come to a complete stop.
The engine will stop at around 1,5 bar.

F. 23/a

Disconnect the hose terminal carefully.
Protect your eyes from splashes.

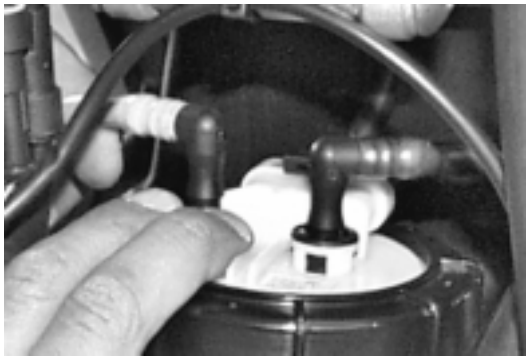
The testing kit (08607400 code) is equipped with quick couplings of the same types of the ones used in the system. In order to disconnect the female terminals (injector side) it is necessary to press the two ends and pull.


F. 23/b

In case it is not possible to extract the terminal, do not attempt to force it but try to rotate it. The system is designed in such a way that an increase in the traction corresponds to an increase of the terminal locking system.

In order to disconnect the male type terminals (pump side), it is necessary to pull the pipe coaxial rings towards the pump support and extract them.

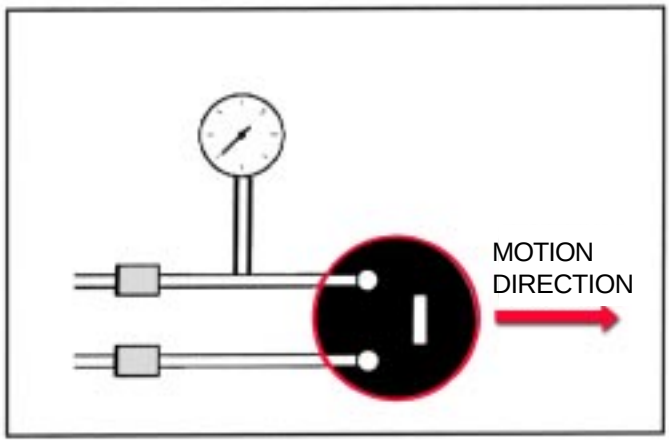
F. 24


F. 25

For practical reasons, the system pressure check must be performed by creating a connection on the pump side.

Connect the pressure regulator to the feed pipe (right hand side) and the extension/ hose to the return pipe (left hand side).

Before the assembly, make sure that the tool ducts are cleaned.



F. 26

12.5 Pressure regulator

Connect the **diagnostic multimeter**. Select the menu from the "ACTIVE DIAGNOSTICS" function.
Select the "RELAY FUEL PUMP" function.

Parameters		**Fuel pump relay**			
Immobilizer		H.T. coil			
Errors		Stepper motor		**Carrying out diagnostic check Please wait**	
Delete errors		Rev. counter			
Active diagnostics		Injector			
CO calibration		Relay fan			
Main	5/8	Diagnostic check	1/6	Fuel pump relay	

Enable the function with the dashboard supply function on and the engine not running.
The central unit controls the pump for 30 seconds.

Let the system bleed for a few seconds. Check the system for leaks.
Check the adjustment pressure with a pump supply voltage higher than 12V.

Adjustment pressure = 300 ÷ 320KPa (3 ÷ 3,2 BAR).

F. 27

OK

The **pressure regulator** is working properly.

NO

The pressure is too high.
Check the return duct for jams or bends.

NO

Replace the pressure regulator
(see pressure regulator p. 78).

Adjustment pressure too low.
Enable the pump rotation. Use a pair of pliers with flat and long ends to close the **return duct** a few time but acting only on the extension of the **testing wiring (it is impossible to perform this operation with the hose supplied with the motorcycle)**

Fuel pressure= > 300 KPa (3 BAR)

F. 27/a

OK

NO

OK

Replace the **pressure regulator.**
(see pressure regulator p. 78).

NO

Replace the fuel pump
(See p. 76)

12.6 Pump and fuel filter check

We suggest to use the following procedure during the maintenance operations to check for the delivery filter operation.

Connect the **diagnostic multimeter.**
Connect the **fuel pressure testing kit** (see p. 68).

Select the diagnostic multimeter menu from the “ACTIVE DIAGNOSTICS” function.
Select the ”FUEL PUMP RELAY” function.
The pump is enabled for 30 seconds.

Parameters	**Fuel pump relay**	
Immobilizer	H.T. coil	**Carrying out diagnostic check Please wait**
Errors	Stepper motor	
Delete errors	Rev. counter	
Active diagnostics	Injector	
CO Calibration	Relay fan	
Main 5/8	Diagnostic check 1/6	Fuel pump relay

Let the system bleed for a few seconds. Check the system for leaks.
Use a pair of pliers with flat and long ends, to close the delivery duct for a few time acting only on the extension of the specific tool with a pump supply voltage higher than 12 V. Check for the system maximum pressure.

Maximum pressure= > 600 KPa (6 BAR)

F. 27/b

OK

NO

OK

Check the system sealing.

Start the pump for 30 seconds by means of the diagnostic multimeter.
After stopping the pump, **wait for 3 minutes** and check the system pressure.
Fuel pressure = > 200 KPa (2 BAR)

NO

The pressure is lower: check with care the pump voltage during work
In case the voltage is higher than 12 V, replace the pump.

OK

This intervention increases the fuel pressure.

NO

The system is properly sealed. Repeat the test. After stopping the pump, use a pair of pliers with flat and long ends to close the **return hose** acting only on the extension of the diagnostic wiring.

F. 27/c

Verify whether the pressure decreases at the same rate when the system is free from compressions.

The pressure decreases at a remarkable lower rate.
Replace the pressure regulator (p. 78).
Check again the system sealing.

No difference recorded.
Repeat the test by compressing the tool hose across the offtake and the injector.
Verify whether the pressure decreases at the same rate when the system is free from compressions.

F. 27/d

The pressure decreases at a remarkable lower rate.

Check the injector sealing and replace it if necessary (THERMAL UNIT AND TIMING) (see Engine Manual).

No difference recorded Repeat the test by compression the tool hose across the offtake and the pump and check whether the pressure decreases at a remarkable lower rate.

F. 27/e

OK

Faulty pump unidirectional valve.
Replace the pump (see pump support revision).

NO

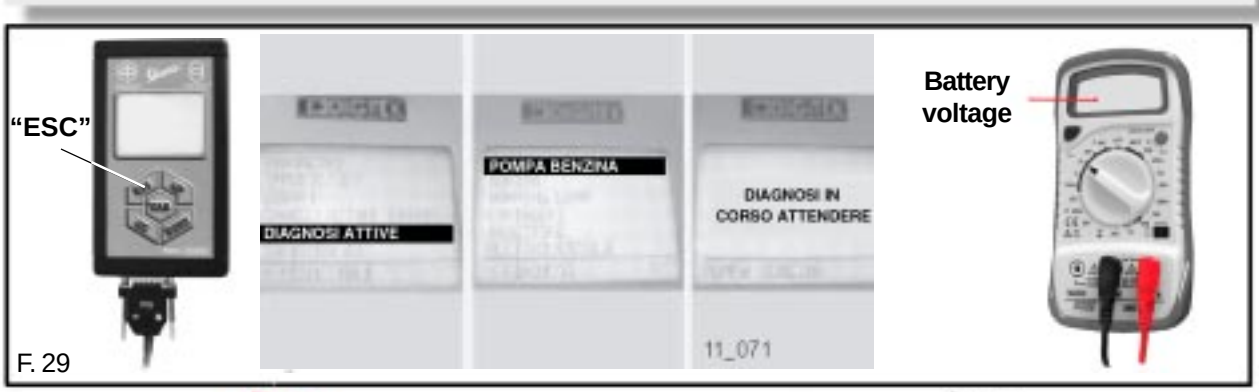
Check the sealing of all the hose and coupling to the injector with care. Repeat the component sealing checks if necessary.

NOTE *- The system bad sealing only affects the quickness of start-up.*

Check the pump free flow
Disconnect the pump connector, start the engine, when it stops reconnect the connector.
Disconnect the fuel **return pipe** from the pump support (left hand side support).
Put the **return pipe** into a graduated container.

F. 28

Use the diagnostic multimeter, activate the fuel pump for 10 seconds then interrupt the test **by pressing the "ESC" button.**
Make sure that the supply voltage is higher than 12V.
Measure the fuel supplied. **Pump free flow = 250 ÷ 320 cc.**



F. 29

OK

The fuel filter is not clogged. It is possible to continue using the motorcycle without exceeding 48000 Km.

NO

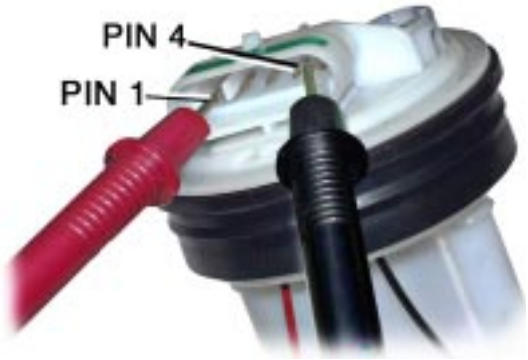
The flow is lower than 250 cc.
The fuel filter is dirty.
Replace the pump support.

12.7 Fuel pump electrical checks

12.7.1 Resistive check

Disconnect the connector from the pump support. Use a multimeter to measure the pump winding resistance.
Connect the multimeter prods to the **PINS (1 - 4)** of the pump support as indicated in the picture.

Resistance = ≥ 1,5 Ω



F. 30

In case that an infinitive resistance is measured, replace the pump.
The pump does not rotate with an infinitive resistance. With a resistance value approaching 0 Ω, the pump uses too much power, and this may lead to the burning of the 10 A fuse no. 6. Perform the check indicated below.

F. 31

12.8 Pump electrical power consumption.

The pump electrical power consumption may vary according to the:
- supply voltage;
- pump running-in;
- adjustment pressure;
- delivery filter cleaning.

In order to check the consumed power proceed as follows:
- disconnect the connector of the **red relay,** controlling the pump;
- with the key switch **on the "OFF" position**, create a jumper across **30-87** on the connector, by means of the **multimeter prods on the amperometer function** (see picture).
- check the pump rotation and power consumption.

Consumed power = ~ 2,5 ÷ 4,2 A
***NOTE** - The indicated power consumption refers to:*
- supply voltage = > 12 V
- runned-in pump
- system pressure= 300 KPa (3 bar)
- cleaned fuel filter.

F. 32

A dirty filter cause an increase in the power consumption. In case of overpressure, the pump consumes ~ **6 ÷ 7 A.**
In case of excessive power consumption (**> 5 A**) is detected, replace the filter. Refer to the pump support revision.
In case the anomaly persists, replace the pump.

12.9 Fuel filter check

In order to check the fuel filter, check the:
- Free flow
- pump power consumption;

A clogged filter may lead to:
- a decrease in the motorcycle performances especially at full power
- an increase in the pump consumption.

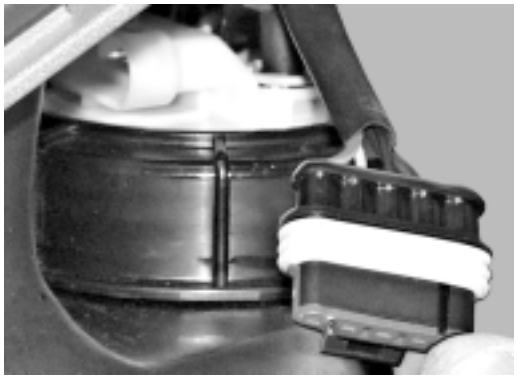
***NOTE -** Do not bleed the filter with compressed air. A damaged filter may cause the injector to clog.*

12.10 Pump support revision

In order to remove the pump support from the fuel tank, proceed as follows:

- Disconnect the electrical connector;
- Start the engine and wait until it stops;
- Clean the tank and the pump support (if necessary, wash and bleed with compressed air);
- Disconnect the delivery and the return pipes by acting on the quick couplings.

Try to prevent the fuel to splash.



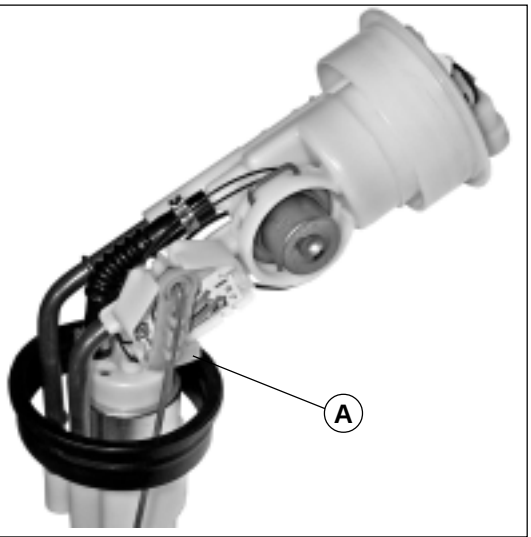
F. 33

- Lose the pump support gear nut.

F. 34

- Remove the pump support and the sealing gasket (A).

NOTE - *While extracting the pump support pay attention not to damage the float arm.*



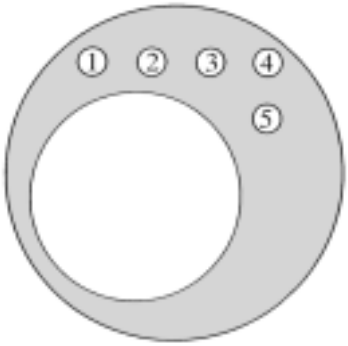
F. 35

In order to replace the components, proceed as follows:

(1) level indicator:

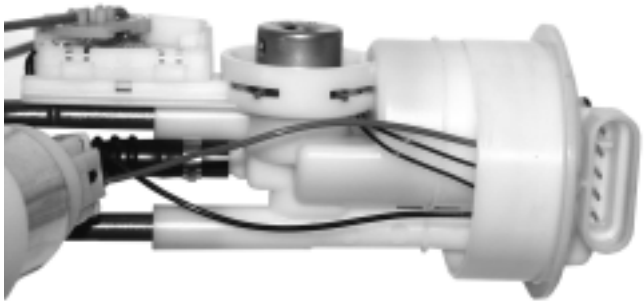
• Take note of the assembling position and of the path runned by the two connecting cables.

pos. 2 = cable connected to the circuit
pos. 3 = cable connected to the mobile cable.



F. 36

- Pass the cables through the hole across filter and pressure regulator.

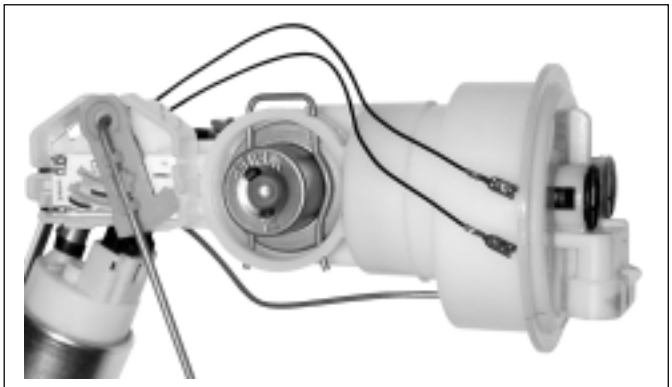


F. 37

- Disconnect the two central cables of the fuel indicator.

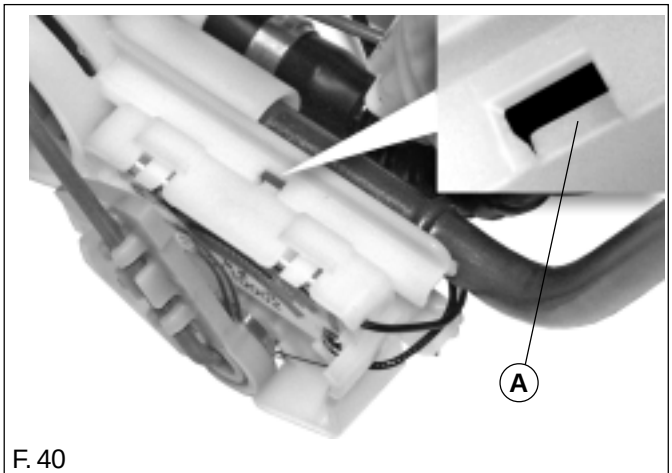
F. 38

- Extract the two cables of the level indicator.



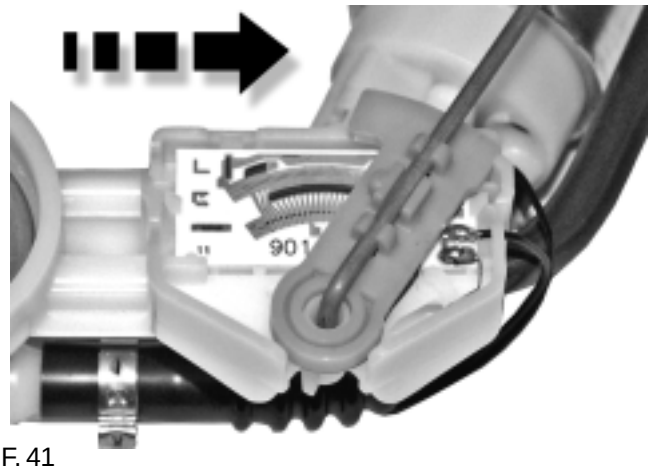
F. 39

- Use a screwdriver to release the snap-on tang (A) of the level indicator.



F. 40

- Extract the level indicator from the tool slide.


F. 41

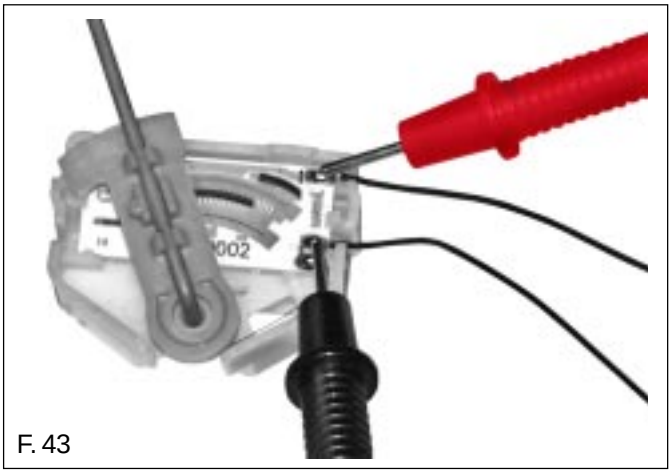
- Level indicator check.
It is possible to perform the check even before disassembling the support.
Measure the resistance across the two cables of the level indicator.

F. 42

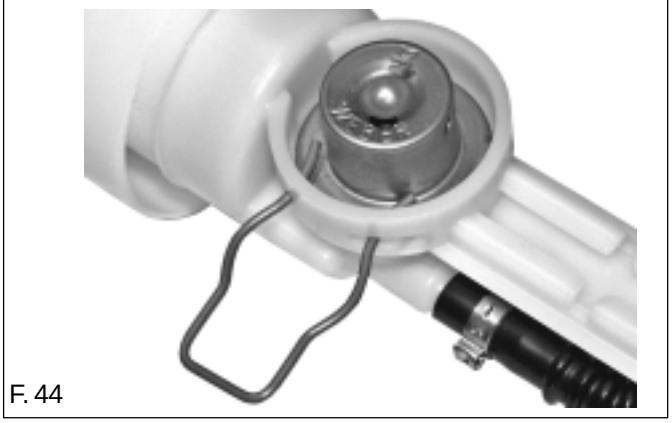
Moving the arm and the float, make sure that the resistance varies according to the arm movement.

Empty tank limit value= 95 ÷ 105 Ω.
Full tank = 0 ÷ 9 Ω.

- Follow the disassembly instructions in the reverse order to assemble the unit.


F. 43

(2) Pressure regulator:
- Remove the retaining spring.


F. 44

- Extract the pressure regulator and the O-rings.

***NOTE** - To remove the O-ring, insert a screwdriver into the openings on the retaining pin side.*

- Follow the disassembly instructions in the reverse order to assemble, after lubricating the O-rings.

F. 45

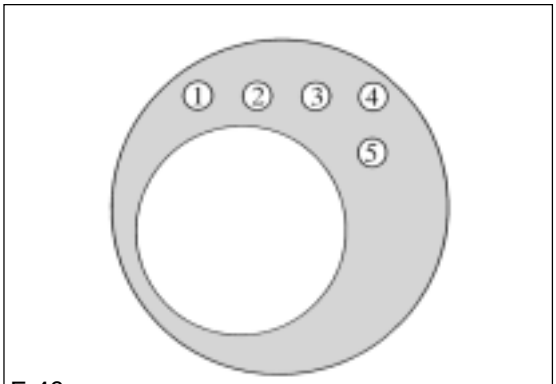
(3) Fuel pump

- Take note of the position of the supply cables on the support

pos 1 = positive (red)
pos 4 = negative (black)

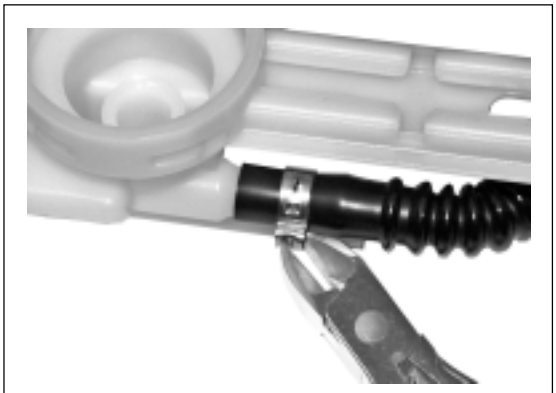
***NOTE** - The pump connection are not interchangeable.*

- Disconnect the supply cables.



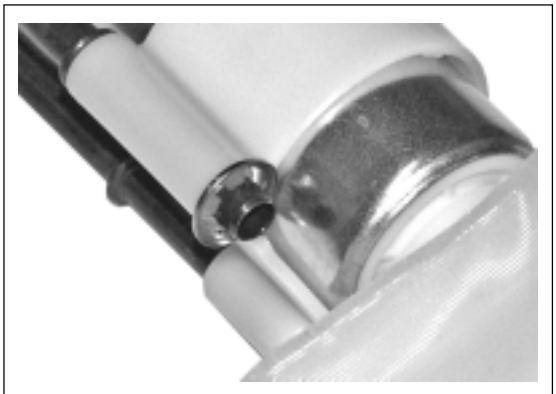
F. 46

- Cut the delivery hose clamp on the support.



F. 47

- Remove the pump fixing washer.



F. 48

- Remove the hose from the filter
- Remove the pump and the ring support and pre-cleaner.

F. 49

- In case the pump needs to be replaced, remove the pre-cleaner and the ring support.
- Follow the disassembly instructions in the reverse order to assemble the unit and use a new hose clamp for the delivery hose and a new washer to secure the pump.

F. 50

NOTE - *In order to clean the pre-cleaner use some fuel and a soft brush.*

F. 51

(4) Fuel filter
The fuel filter is equipped already assembled along with the pump support.
In order to replace the support, replace the level indicator, the pressure regulator and the pump from the old support.
Always follow the above instructions when performing these interventions.

F. 52

12.11 Fitting the pump support on the tank

- Before carrying out the assembly procedure, make sure that the tank is clean;
- In case of dirt or water, disassemble the tank;
- Fit the sealing gasket on the pump support.
- Insert the pump into the tank, paying attention not to damage the level indicator arm;
- Position the sealing gasket on the tank;
- Install the pump support, making sure to fit the connector in line with the longitudinal axle of the motorcycle.

NOTE - The level indicator operation *may be jeopardised by an incorrect position.*

- Tighten the mounting ring nut and lock it firmly.

Locking torque:
motor-driven pump locking ring nut 20 N·m.

- Reconnect the supply circuit hoses, making sure they are properly plugged by checking the upward traction and rotation;
- Reconnect the electrical connector;
- Recharge the system for at least 4÷5 cycles (key switch on OFF-ON).

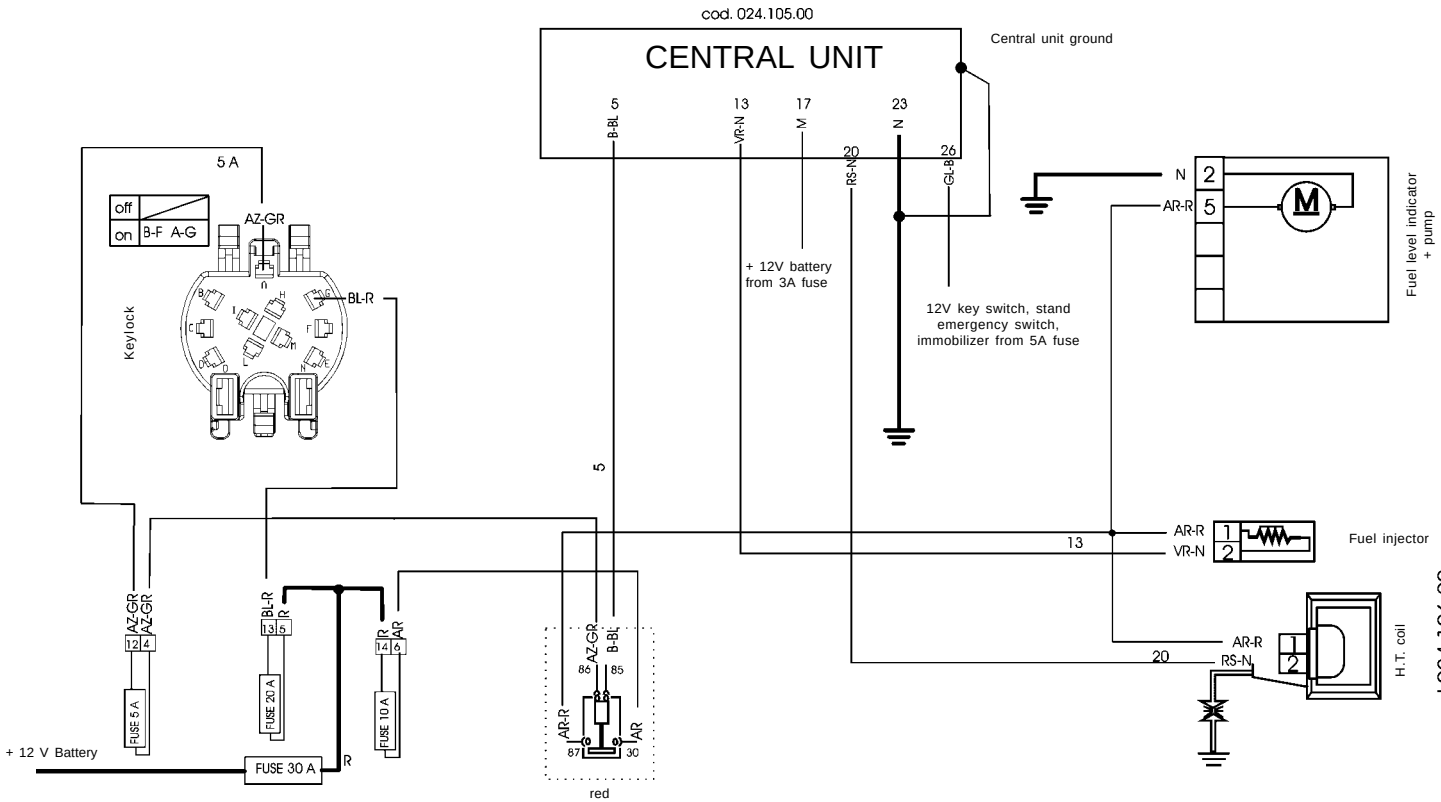
NOTE - *Never start the pump before refilling the tank. Failure to observe this rule may damage the pump.*

- Check the sealing of the supply system quick couplings.

12.12 Injector circuit check

TERMINALS	CONDITIONS	STANDARD
13 - 23	Pump cycle with engine not running	Battery voltage

12.13 Circuit diagram



Sch. 5

Connect the diagnostic multimeter. Select the menu from the ”ACTIVE DIAGNOSTICS” function. Select the ”INJECTOR” function.

Parameters		Fuel pump relay	
Immobilizer		H.T. coil	
Errors		Stepper motor	
Delete errors		Rev. counter	
Active diagnostics		**Injector**	
CO calibration		Fan relay	
Main	5/8	Diagnostic check	5/6

Enable the function with the dashboard supply on and the motor not operating. The central unit controls the fuel pump in continuous mode, while opening the injector. The injector openings will be repeated for a few seconds.

Make sure the injector opening can be heard and wait for the multimeter reading.

Heard 4 injector openings. The injection multimeter reads “test ended with success”.

Efficient injector control circuit. Perform the hydraulic check of the injector.

No injector opening heard.
The injection multimeter reads “test failed”.

No injector opening heard.
The injection multimeter reads “test ended with success”.

Efficient injector control circuit.
Verify again whether the injector openings can be heard and perform the hydraulic check of the injector.

Select the menu from the ”ERRORS” function and check whether the injector failure is the only indicated anomaly.

Throttle			
Pressure			
Water temperature			
Air temperature			
Battery voltage			
Injector		•	
Errors	1/3	A	M

OK

Other anomalies are signalled:
pump relay.

H.T. coil	•
Stepper motor	
Pump relay	•
Fan relay	
Signal panel	
RAM memory	
Errors	2/3 A M

Check the pump relay control circuit
(**red relay**).

Also the H.T. coil anomaly is signalled.

Check the supply circuit:
10A fuse and red relay.
Common supply system to the fuel pump.

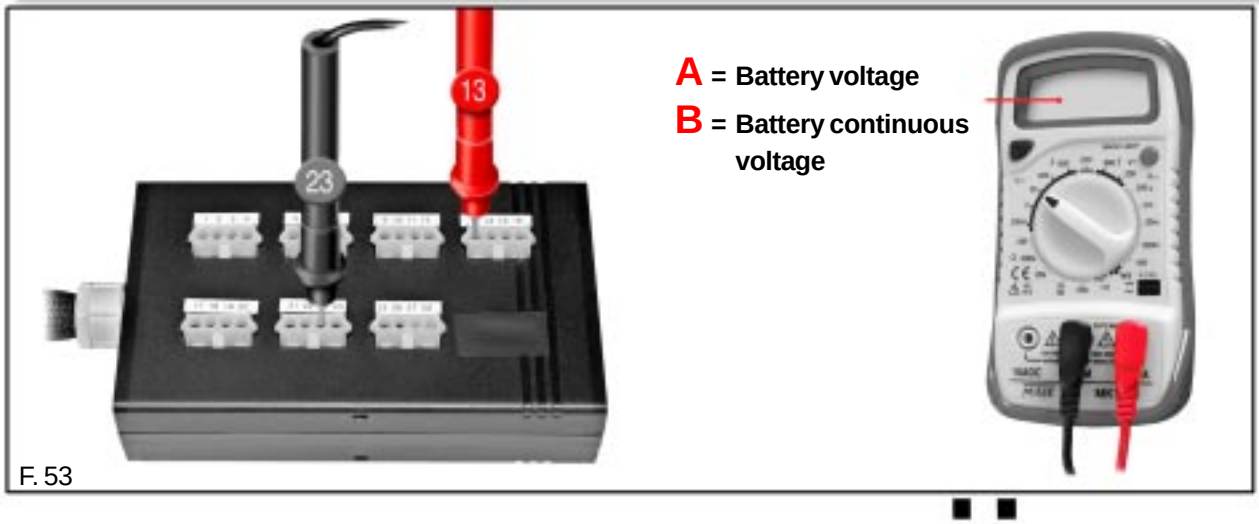
OK

Fit the testing wiring across the central unit and the system.
Position the multimeter positive prod on **PIN 13** and the negative prod on **PIN 23**.
Move the key switch to the “ON” position, the emergency switch on “RUN” and lift the side stand.
Check the battery voltage during the fuel pump cycle.

A) PIN 13 - PIN 23 = battery voltage for 2 seconds: test ended with success.

B) PIN 13 - PIN 23 = continuous voltage: test failed.

Repeat the test. In case the anomaly persists, check the central unit connector. Replace the central unit, if necessary.



F. 53

NO

NO

Disconnect the connector to the central unit.

Check the resistance across the **PIN 13** and the **orange/red** cable end on the **PIN 87 connector** (**red relay**).
Resistance = 14,5 **Ω** ± 5% (injector resistance).

F. 54

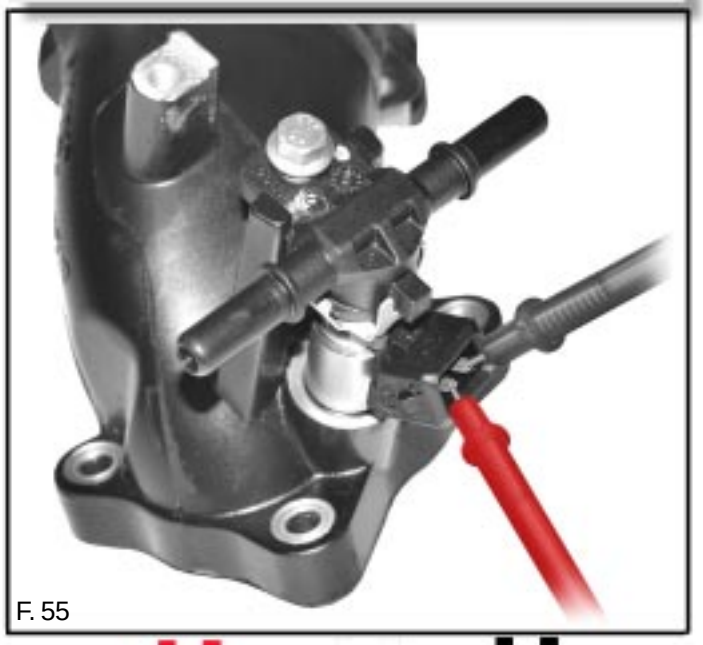
NO

No continuity.
Disconnect the connector and repeat the resistive check directly on the injector ends.
Resistance = 14,5 Ω ± 2%

Make sure that the injector negative line is insulated from ground. C**entral unit and injector connector disconnected**.
PIN 13 - PIN 23 = Ω infinitive.

NO

Restore the **green/black** insulation from ground.


F. 55

OK

NO

OK

Check the continuity of: (multimeter Ω)
A) the **green/black cable** across the central unit connector **PIN 13** and the injector connector.
B) the **orange/red** cable across the injector connector and the **red relay PIN 87.**

NO

Replace the injector.

12.14 Injector hydraulic check

In order to perform the injector check, we suggest to disassemble the intake manifold with the throttle body and the injector.
Disassemble the injector from the manifold only if strictly necessary.
Refer to the chapter “THERMAL UNIT AND TIMING” (Service Engine Manual) to carry out the above mentioned interventions.

Connect the diagnostic multimeter by means of the plug positioned under the seat.

Fit the diagnostic wiring, the fuel pressure checking kit. In this case, the injector can be connected directly to the instrument quick couplings.

Use a graduated container of at least 100 cm^3 with 10÷20 cm^3 resolution.

Connect the injector to the cable supplied with the injector multimeter. The cable is equipped with alligator clips for direct connection to the battery. Prepare the auxiliary battery.

Move the key switch to the “ON” position and the emergency switch to “RUN” and lift the stand.
Select the ”active diagnostics” function.
Start the pump diagnostic check.

During the **30 seconds of the** pump diagnostic check, supply the injector by means of the cable and the auxiliary battery for **15 seconds**.
Use a graduated container to collect the fuel supplied by the injector.

Supply pressure= 300 KPa (3 BAR)
Supplied quantity = around 40 cm³

OK

Check the injector sealing.
Dry the injector outlet by means of compressed air. Start the fuel pump. Wait for a minute and then make sure that there are no leaks from the injector outlet.
A light dripping is normal.
Limit value = 1 drop in 1 minute.

NO

Higher quantity should not be considered as normal.
In case of lower quantities, replace the injector (THERMAL UNIT AND TIMING) (see Engine Manual).

F. 56

NO

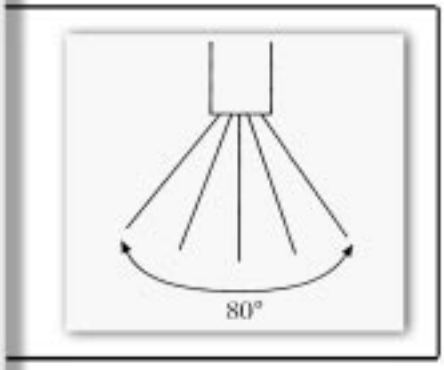
Repeat the testing. If the anomaly persists, replace the injector (THERMAL UNIT AND TIMING) (see Engine Manual).

OK

The injector operation is normal.

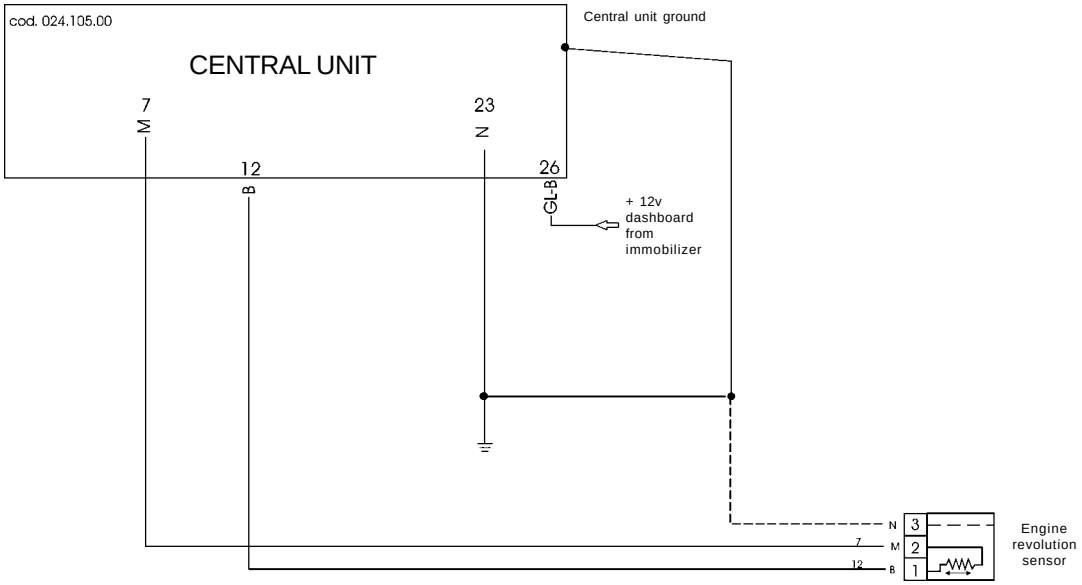
The injector atomisation cannot be verified by using simple instrumentations. The injector is equipped with 5 nozzles that, thanks to their position, create a jet with a taper of proximately 80°. This jet reaches both intake valves.

NOTE *- An injector having a low flow affects the max. performances of the motorcycle.*
- an injector having a scarce sealing affects above all the idling speed and the start-up especially after stopping at warm engine.
- In case the injector nozzles are clogged, replace the injector, the filter and the fuel contained in the tank. Clean the ***system and the tank with care****.*



F. 57

13. RPM SENSOR

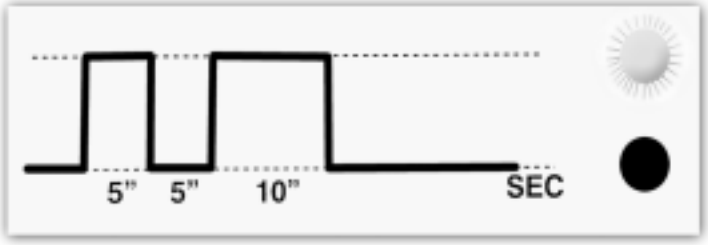


Sch. 7

The sensor allows detecting the engine rpm and the angular inclination of the engine shaft with respect to the TDC. As the phonic wheel is splined to the camshaft, it is possible to detect the 4-stroke cycle. This allows controlling the injector and the spark plug every 2 revolutions on the engine shaft. The sensor is of the reluctance change type, and it can thus be compared to an alternating voltage generator supplying the central unit. The signal frequency is interrupted by the vacuum created by the two missing teeth on the phonic wheel.

F. 58

The sensor signal is necessary to start the engine but the engine can operate also with an unstable signal, thanks to corrective interventions to the central unit.
The injection led does not turn on in case the rpm signal is missing. When the signal anomaly (open circuit) occurs while using the motorcycle on the road, the led signals the beginning of the anomaly, blinking as follows:
A Led on
B Led off



F. 59

LED ON LED OFF

In order to check the sensor and the sensor circuit proceed as follows:

Connect the diagnostic multimeter. Start the engine.

OK

The engine started regularly.

Select the menu from the "**ERRORS**" function.
Check the "**signal panel**" for anomalies.

H.T. coil			
Stepper motor			
Pump relay			
Fan relay			
Signal panel		•	•
RAM memory			
Errors	2/3	A	M

NO

Select the menu from the "**PARAMETERS**" function.
Check the number of:
Lost synchronisations = 1 tooth
Lost synchronisations = > 1 tooth

Lost synchronisations 1D	0
Lost synchronisations > 1D	0
TPS reset	NO
CO already calibrated	NO
R/O step diff.	53
Atmospheric pressure mmHg	774.4
Parameters	3/3

NO

Indication = 1÷3
The Rpm/speed signal is normal.

OK

The value progressively increases, insisting on the engine start-up.
Check the circuit and the sensor.

NO

The engine does not start.
Select the menu from the "**ERRORS**" function.

NO

No anomaly detected.

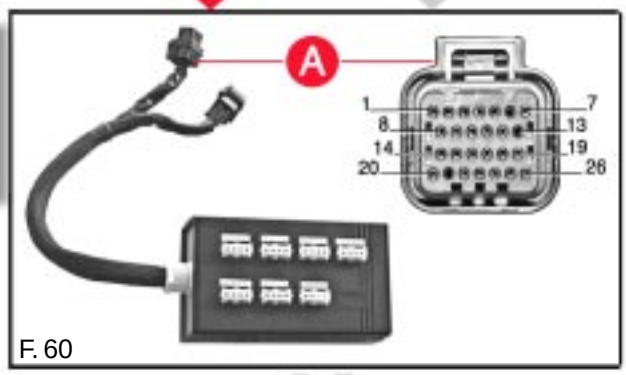
OK

Carry out the intervention required by the detected anomaly.

OK

Connect the testing wiring only to the system connector.
Do not connect to the central unit.

OK



F. 60

Disconnect the connection across the rpm/speed sensor and the system.
Measure the sensor resistance by connecting the multimeter across the **+** and **–** terminals.
Rpm/speed sensor resistance = 680 Ω ± 15%.

F. 61

OK

NO

Replace the rpm sensor.

Make sure that the pole and shielding are insulated from the ground. **S - +** = infinitive (>1MΩ).

F. 62

NO

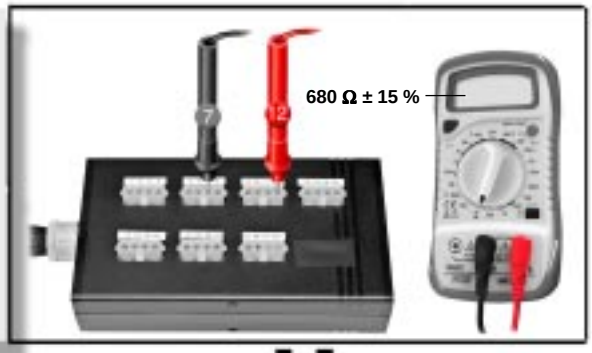
OK

OK

Reconnect the rpm/speed sensor connector.
Repeat the check by using the testing wiring across **PIN 7** - **PIN 12**.

PIN 7 - PIN 12 = 680 Ω ± 15 %

The value should approach the value measured by the sensor.



F. 63

NO

Higher or infinitive resistance.

Check connectors with care. Disconnect the **brown cable** and check it for interruption across the central unit **PIN 7,** the sensor **PIN 2** and for the **white cable** interruption across the central unit **PIN 12 and the sensor PIN 1**.

Restore the interrupted cable.

NO

Resistance= 0 Ω. Restore or replace the connections (short-circuit).

OK

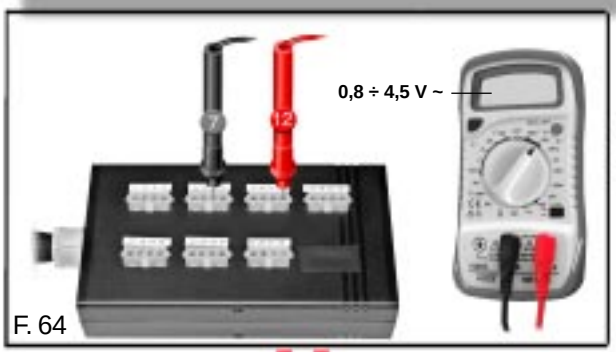
Check again for the insulation from the ground.
7-23 = infinitive (>1MΩ).

OK

NO

Disconnect spark plug cap.
Measure the **alternating current** across the **PIN 7** and the **PIN 12** with the **engine idling speed.**
PIN 7 - PIN 12 = 0,8 ÷ 4,5 V~
Rpm = ~300 ÷ 400 G/1'

Check the sensor and central unit connectors.
Repair or replace the connections.



F. 64

NO

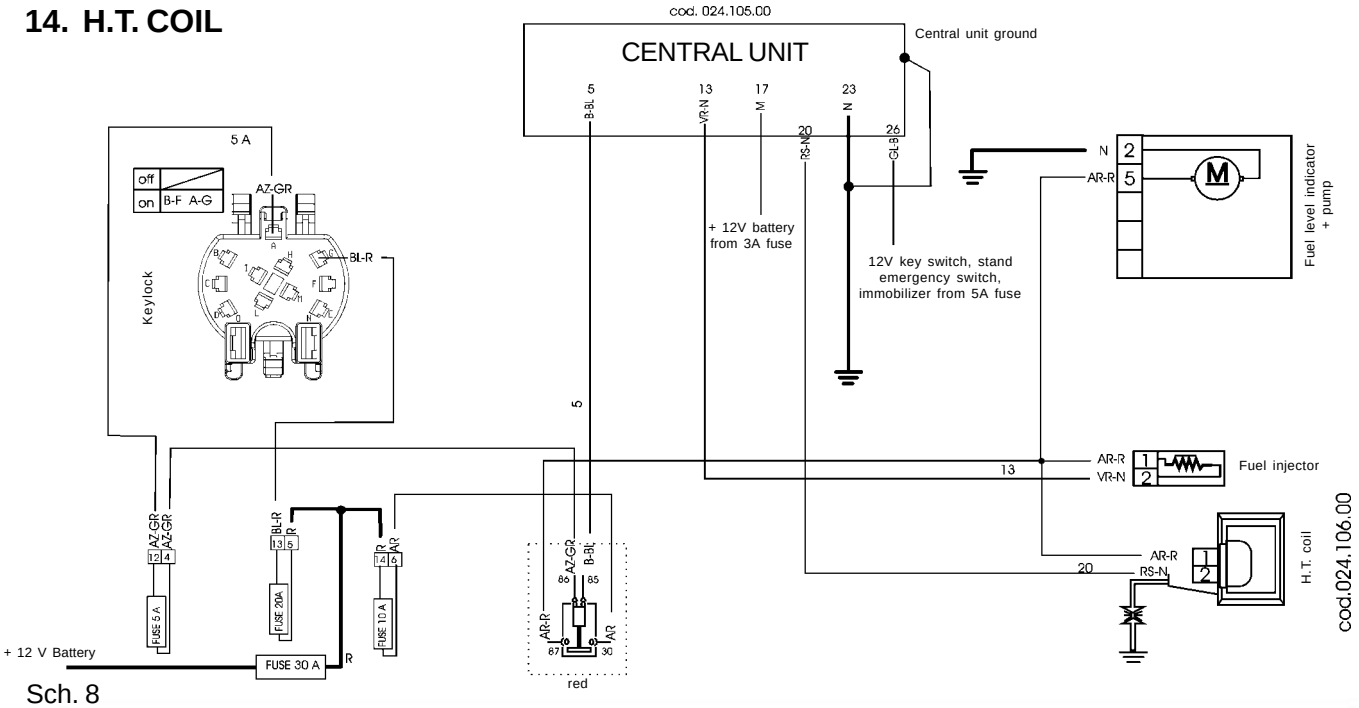
OK

Check the air gap and the sensor magnetic activity.
See chapter THERMAL UNIT AND TIMING (Engine Manual).
In case the magnetic activity is zero, replace the sensor.

The sensor circuit operation is normal.
If the start-up anomaly persists, replace the central unit.

NOTE - During the repair interventions, make sure to connect the sensor cable properly.
- Do not force the cable.
- A bad quality shielding of the cable may affect the engine operation at the higher speeds.

14. H.T. COIL



Sch. 8

The integrated ignition system with injection is of high efficiency inductive type. The central unit controls two important parameters:

- Spark advance

It is optimised according to: the engine rpm, the engine load, the room temperature and pressure.

With the engine at idling speed the spark advance is optimised in order to make the engine speed stable at 1450 ± 50 Rpm/1'.

- Magnetisation time

The coil magnetisation time is controlled by the central unit.

The ignition power is increased during the engine start-up.

The injection system recognise the 4-stroke cycle and thus the ignition is controlled only during the compression phase.

In order to check the ignition circuit, proceed as follows:

Connect the diagnostic multimeter. Select the menu from the "ACTIVE DIAGNOSTICS" function. Start the H.T. coil testing with the key switch on the "ON" position, the emergency switch on "RUN" and the side stand lifted.

Wait for the multimeter response.

Parameters	Fuel pump
Immobilizer	**H.T. coil**
Errors	Stepper motor
Delete errors	Rev. counter
Active diagnostics	Injector
CO calibration	Fan
Main 5/8	Diagnosis 2/6

TEST ENDED WITH SUCCESS

TEST FAILED

Select the menu from the "ERRORS" function. Check for current or stored errors concerning the H.T. coil.

REPEAT THE TEST

TEST FAILED

NO

OK

NO

The coil control circuit operation is normal.

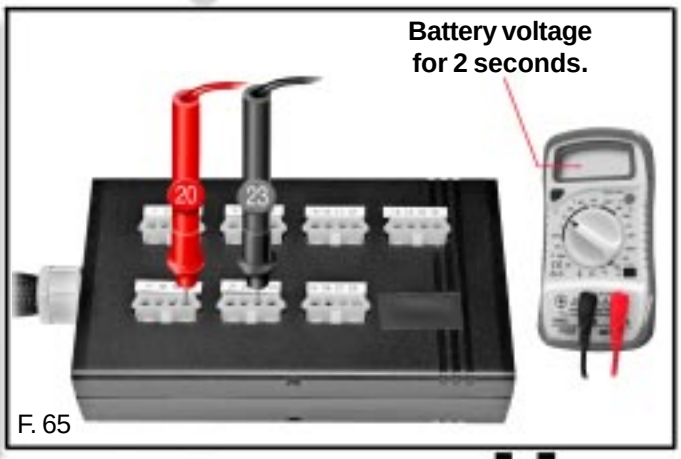
Carry out the check of the **H.T. coil secondary circuit, cable and shielded cap** (see p. 95).

OK

Connect the testing wiring across the central unit and the system.

Measure the voltage across the testing wiring **PIN 20** and **PIN 23** during the fuel pump cycle.
To start the cycle move the key switch to the “ON” position and the emergency switch to “RUN” and lift the side stand.
PIN 20-PIN 23 = Battery voltage (in combination with the pump rotation - 2 sec.).

In order to increase the testing time, enable the ”**pump relay diagnosis**” function (30 seconds).



F. 65

OK

The coil main control circuit operation is normal. Check the central unit and the coil connectors with care. Replace the central unit if necessary.

NO

Disconnect the connection to H.T. coil main circuit
Measure the voltage again:

- **PIN 1 of the coil connector**
- **PIN 23 of the central unit**

Voltage in combination with the pump rotation (2 seconds).

F. 66

OK

NO

Check for the **orange/red cable** continuity.
Repair or replace the connections.

NOTE - *In case of control red relay anomaly the pump does not rotate.*

OK

The positive power supply is normal. Check the continuity across the coil connector **PIN 2** (**pink/black cable**) and **PIN 20**.

Pink/black PIN 20 = continuity

F. 67

NO

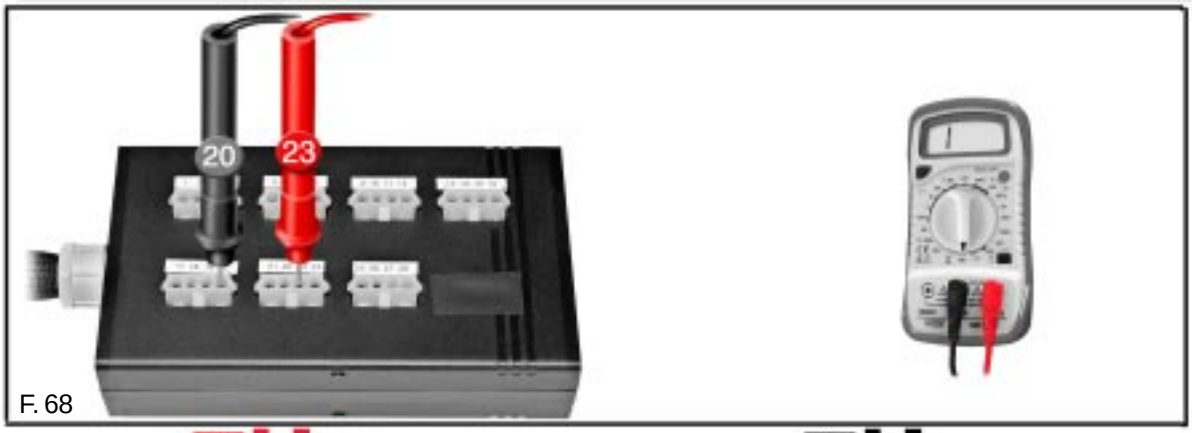
Restore or replace the system.

Repeat the test from the “ACTIVE DIAGNOSTICS” menu.

OK

Without connecting the coil connector, make sure the negative line is insulated from the ground.

PIN 20 - PIN 23 = Ω infinitive (>1MΩ)



F. 68

OK

NO

NO

Disconnect the connector across the motorcycle and injection system.

Repeat the check of the two section insulation from the ground.

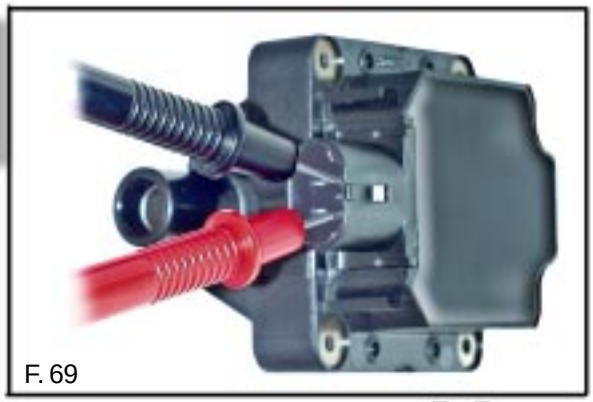
Repair or replace the concerned connections.

Repeat the check from the “ACTIVE DIAGNOSTICS” menu, H.T. coil simulation.

Delete the errors stored in the memory.

OK

Check the **resistance of the coil main circuit** H.T.(see picture).
Main circuit resistance = 0,5 Ω ± 8%



F. 69

OK

Check for the main circuit insulation from the ground. Carry out the measurement across the main circuit two terminals and the ground.
Main circuit-ground= infinitive (>1MΩ).

F. 70

OK

NO

NO

OK

Secondary circuit resistance check.
Measure the resistance across one of the two terminals of the main circuit and the spark plug cable output.
Main circuit- H.T. cable outlet = 3,1KΩ ± 9%

F. 71

OK

The coil operation is normal.

NO NO NO

Replace the coil.

14.1 Shielded cap check

Measure the resistance of the shielded cap.
Resistance= 5 KΩ.
In case a remarkable difference in values is detected (<1; >20K**Ω**), replace the shielded cap.

NOTE *- An unefficient shielding of the cap or the candle may cause anomalies in the injection system operation. For further information on the spark plug, see the "CHARACTERISTICS AND SERVICE" chapters (see Engine Manual).*

F. 72

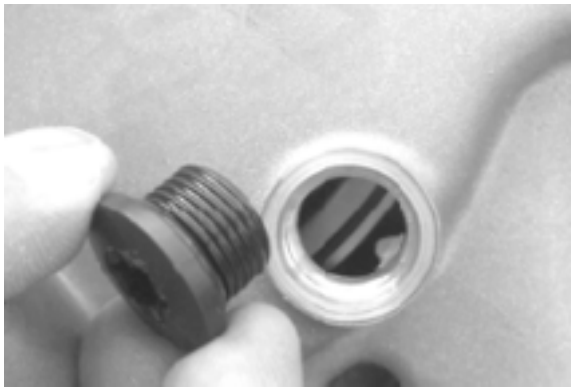
14.2 Ignition timing

The spark advance is electronically controlled by the central unit according to known parameters. For this reason, it is not possible to give any reference value based on the engine revolutions.

The spark advance value can be detected in any moment by means of the diagnostic multimeter.
Use a stroboscopical lamp, to make sure that the spark advance determined by the injection system corresponds to the one actually used on the engine.

Proceed as follows:
- Remove the outside transmission cover as indicated in the “AUTOMATIC TRANSMISSION” chapter of the **Engine Service Manual.**

- Remove the reference TDC inspection cap between the flywheel and the cap carter. Refer to the FLYWHEEL CAP paragraph (**Engine Service Manual**).



F. 73

- Acting on the driving pulley nut, rotate the engine until the TDC identification reference marks are reached.

F. 74

- Align the driving pulley and the transmission cover by means of the reference mark.

F. 75

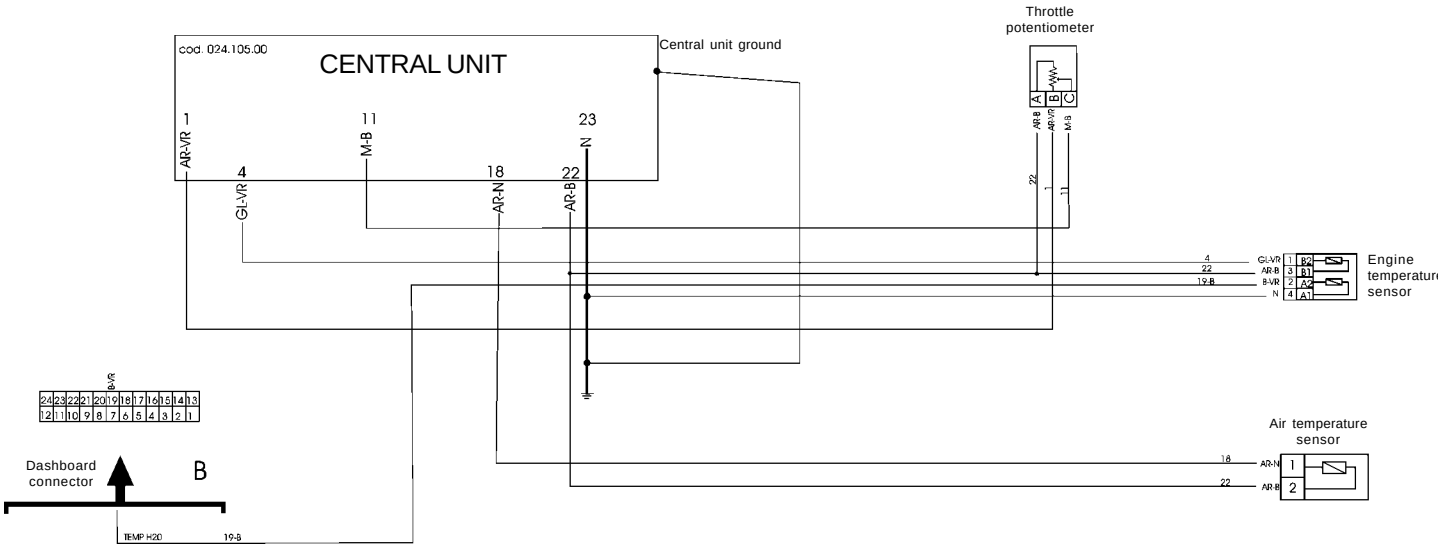
- Fit the inspection cap back on the flywheel side.
- Connect the diagnostic multimeter.
- Start the engine.
- Select the menu from the ”PARAMETERS” function.
- Select the stroboscopical lamp control in the traditional 4-stroke engine position (1 spark, 2 revolutions).
- Make sure that the actual number of rpm and the spark advances match the data read by diagnostic multimeter.

In case the data does not match, check:
- distribution timing – engine rpm/speed sensor - injection central unit.

15. COOLANT TEMPERATURE SENSOR

TERMINALS	CONDITIONS	STANDARD
4-22	coolant temperature	A sensor connected:
		20° = 2500 ± 100 Ω
		80° = 308 ± 6 Ω

15.1 Circuit diagram



Sch. 9

The coolant temperature sensor assembled on the engine head provides all the indications for the digital instrument and injection.
It is made of two electrically separated sections.
The injection section is made by means of a NTC sensor connected to a 5V-supplied circuit. The resistance change cause a change in the circuit voltage, that can be combined to a temperature value.
The central unit uses this information to control the engine operation, optimising all the temperature values.
In case of failure of the circuit, the injection led and the protections turn on (continuous fan operation included). In these conditions, the engine operates, even if not at its best, safeguarding the integrity of the catalytic converter.
The most difficult anomaly to correct is a wrong temperature reading included within the possible temperature value range that may lead to a failure of the protection operation and/or a bad carburetion. The described anomaly is more likely to occur during the engine start-up.

In order to carry out the sensor and circuit check, proceed as follows:

Connect the diagnostic multimeter.
Select the menu from the ”ERRORS” function.
Check the coolant temperature sensor for anomalies.

NO

The EMS system has not received any temperature value not included within the possible temperature value range.
In case of a reliable suspect that the read temperature is not correct, proceed anyway with the check operation indicated below.

NOTE *- An incorrect temperature value can be read by combining the analog equipment indication when starting the fan.*
In any case, before performing the sensor check, make sure that the cooling system is filled in and bled. See ***Service Manual - Cycle parts.***

OK

Before performing the sensor and circuit check, we suggest to wait for the engine to cool down completely until the motorcycle temperature reaches the room temperature.

Move the key switch to the “ON” position and the emergency switch to “RUN” and lift the side stand. Select the menu from the “PARAMETERS” function. Do not start the engine.

Check the following indications:
coolant temperature
intake air temperature
room temperature (see dashboard).
The three values should be the same or slightly differ (e.g.: 1° C).

OK

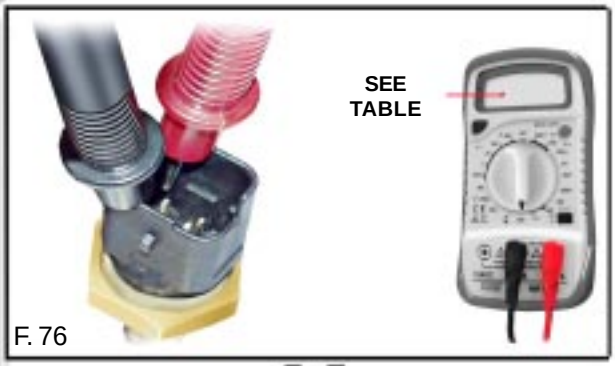
The temperature sensor indication may be correct.
Carry out the testing procedure at ~80° C.

NO

Fit the diagnostic wiring. **Do not connect the central unit connector.**

Disconnect the coolant temperature sensor connector.
Measure the resistance of sensor across the terminals indicated in the picture.
Make sure that the resistance matches the values stated on the basis of the temperature function.

RESISTANCE	TEMPERATURE
9,6 KΩ	-10° C
5,975 KΩ	0
3,81 KΩ	+10° C
2,5 KΩ	**+20° C**
1,68 KΩ	+30° C
0,3 KΩ	+80° C



F. 76

NO

Replace the sensor.

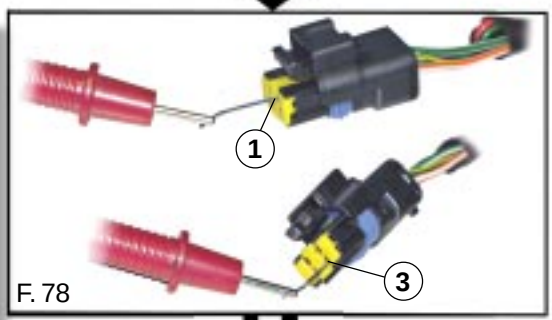
OK

Connect the sensor connector and repeat the resistive check across **PIN 4** and **PIN 22**.
PIN 4 - PIN 22 = Resistance corresponds to the value measured directly by the sensor.

F. 77

NO

In case that slightly higher values are measured, check the connectors.
In case of infinitive resistance (>1MΩ) check the continuity across the two lines with the connectors disconnected.
Yellow/green
Central PIN 4 = 0 Ω (continuity)
Orange/white
Central PIN 22 = 0 Ω (continuity)



F. 78

NO

Restore the interrupted line.

OK

OK

Make sure that the sensor circuit is insulated from the ground.

PIN 4 - PIN 23 = Ω infinitive (>1MΩ)
PIN 22 - PIN 23 = Ω infinitive (>1MΩ)

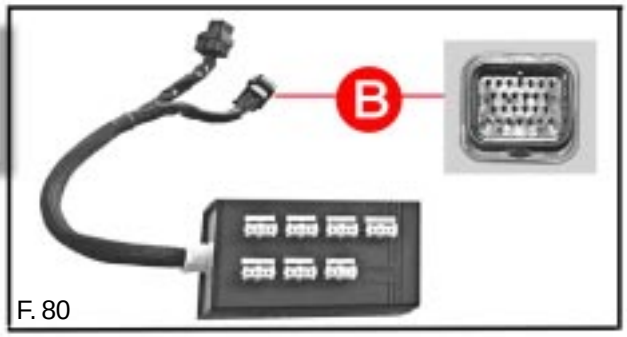
F. 79

NO

Restore or replace the connections. Check the position of the air temperature and gas valve lines.

OK

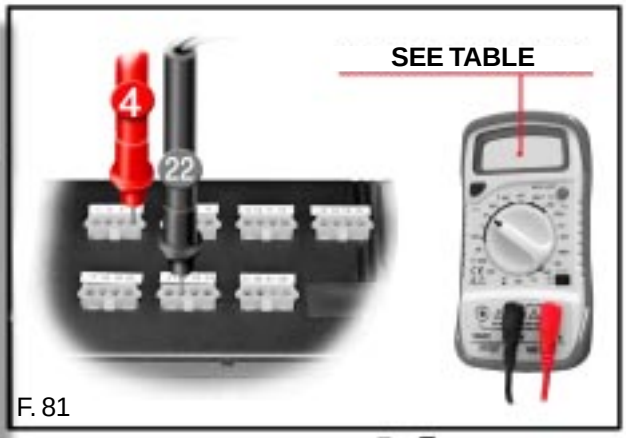
Connect the testing wiring to the central unit (connector - B).
Move the key switch to the "ON" position an the emergency switch to "RUN" and lift the side stand.



F. 80

Measure the voltage across **PIN 4** and **PIN 22**;
PIN 4 - **PIN 22** = V (see table)

VOLTAGE V	TEMPERATURE
4,50	- 10° C
3,73	0
3,25	+ 10° C
2,76	+ 20° C
2,26	+ 30° C
0,70	+ 80° C



F. 81

NO

Measured value = 5 ± 0,2 V.
Repeat the check concerning the connection and sensor continuity.

OK

NO

Measured value = 0 V.
Repeat the check of the circuit and sensor insulation from the ground.

OK

NO

OK

Check the connection to the central unit.
Make sure the central unit is receiving power supply.
Replace the central unit if necessary.

NO

Restore or replace the connections.

OK

Start the engine and make sure that the voltage decreases according to the increase in temperature, as indicated in the table.

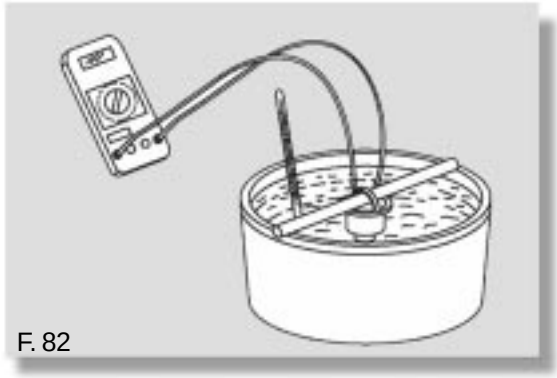
OK

The temperature signal is normal.

NO

Replace the temperature sensor.

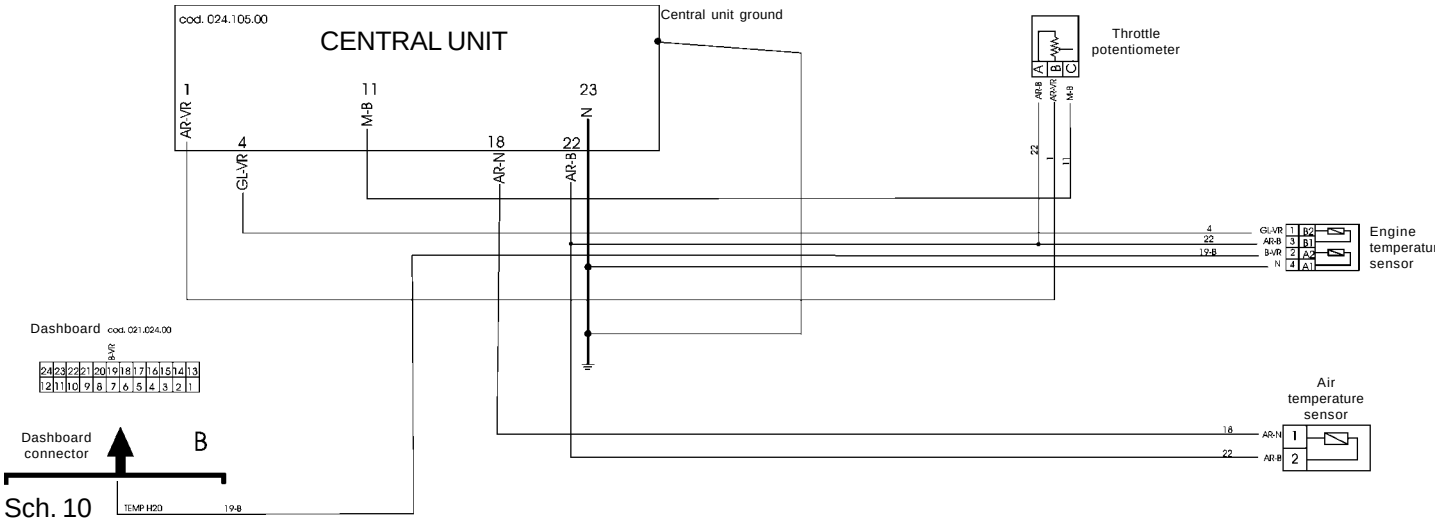
NOTE *- In order to perform a more precise check of the sensor, remove it from the engine and check its resistance at controlled temperature.*
Using a suitable container, plunge part of the sensor metal prod into the water, warm it up gradually and read the temperature and resistance values.
Compare with the table values.



F. 82

16. INTAKE AIR TEMPERATURE SENSOR

TERMINALS	CONDITIONS	STANDARD
18 - 22	intake air temperature 20°	With the sensor connected:
		3750 ± 200 Ω

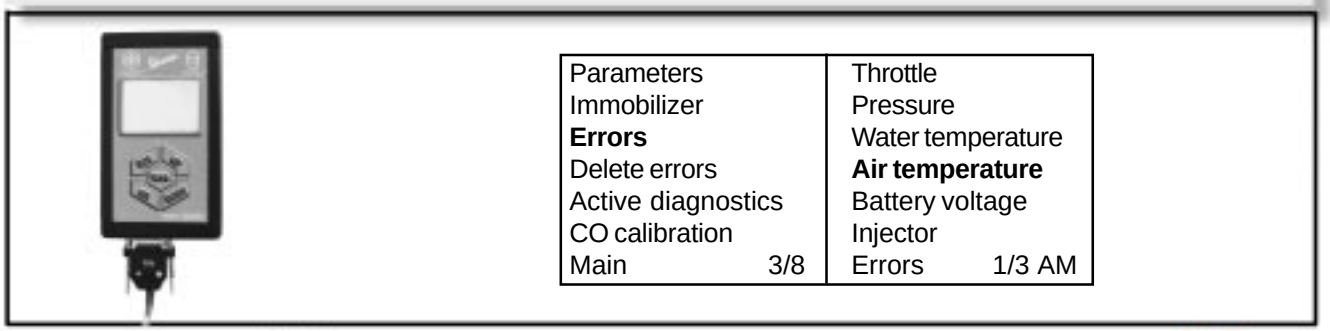


Sch. 10

The intake air temperature sensor is fitted inside the lower part of the throttle body on the airbox side.
The sensor is NTC with the same operating diagram of the coolant temperature sensor.
This signal is used in order to optimise the engine operation but it remains a less important information compared to the coolant temperature signal.
In case of failure of the circuit, the central unit switches the injection led on and enable the protections control thus ensuring the engine operation.

In order to check the sensor and the circuit, proceed as follows:

Connect the diagnostic multimeter. Select the menu from the "ERRORS" function. Check the intake air temperature sensor for anomalies.



NO

The EMS system did not receive any temperature values not included within the possible value range. In case of a reliable suspect that the temperature read is not correct, proceed with the check indicated below.

OK

Before performing the sensor and circuit check, we suggest to wait for the engine to cool down completely until the motorcycle temperature reaches the room temperature.

Move the key switch to the "ON" position and the emergency switch to "RUN" and lift the side stand.
Select the menu from "PARAMETERS" on the diagnostic multimeter.

Check the following indications: coolant temperature - intake air temperature - room temperature indicated by the digital instrument.
The three values should be equal or slightly differ (e.g.: 1° C).

OK

The intake air temperature sensor may be reading a correct value.

NO

Fit the diagnostic wiring. Do not connect the central unit connector.

Disconnect the intake air temperature sensor connector. Measure the resistance across the sensor terminals.
Make sure that the resistance matches the stated values with respect to the temperature.

RESISTANCE	TEMPERATURE
9,6 KΩ	- 10° C
5,975 KΩ	0
3,81 KΩ	+10° C
2,5 KΩ	+20° C
1,68 KΩ	+30° C

F. 83

NO

Replace the sensor.

OK

Connect the sensor connector and repeat the resistive check across **PIN 18** and **PIN 22**.

PIN 18 - PIN 22 = the resistance matches the value read directly by the sensor.

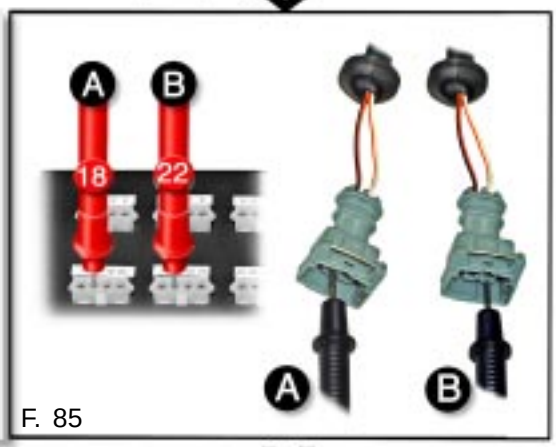
F. 84

NO

In case that slightly higher resistance values are measured, check the connectors.
In case of infinitive resistance (>1MΩ), check the continuity of the two lines with the **connectors central unit and the intake sensor disconnected.**

A) Orange/black
PIN 18 = 0Ω (continuity)

B) Orange/white
PIN 22 = 0Ω (continuity)



F. 85

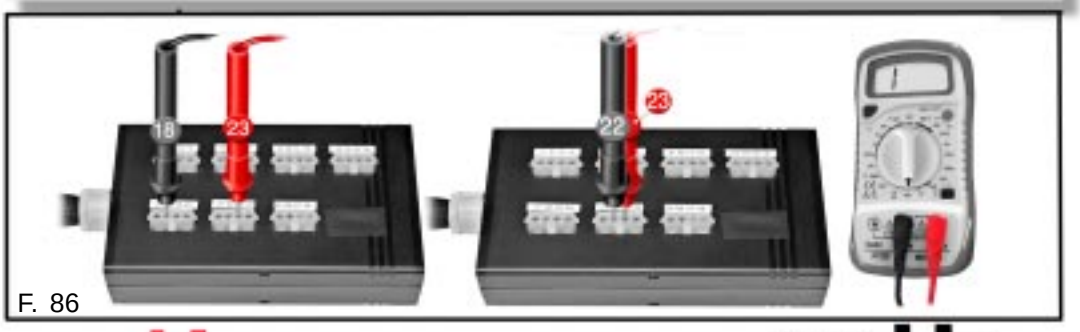
NO

Restore the interrupted line.

OK

OK

Make sure that the sensor circuit is insulated from the ground.
PIN 18 - PIN 23 = Ω infinitive (>1MΩ)
PIN 22 - PIN 23 = Ω infinitive (>1MΩ)



F. 86

NO

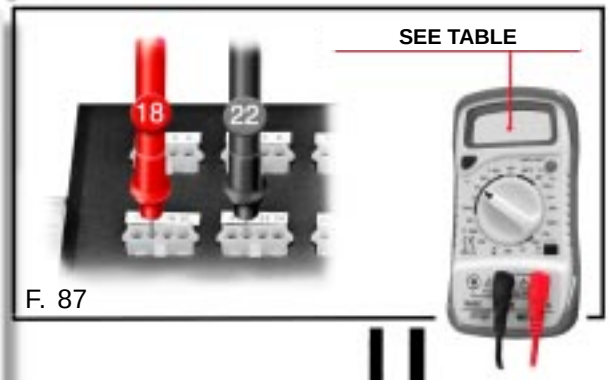
Restore or replace the connections. Check the fluid temperature and the valve position lines.

OK

Connect the testing wiring to the central unit. Move the key switch to the "ON" position the emergency switches to "RUN" and lift the side stand.

Measure the voltage across **PIN 18** and **PIN 22**.
PIN 18 - PIN 22 = V see table.

VOLTAGE V	TEMPERATURE
4,50	-10° C
3,70	0
3,26	+10° C
2,76	+20° C
2,23	+30° C



F. 87

NO

Measured value = 5 ± 0,2V
Repeat the checks concerning the sensor and wiring continuity.

NO

Measured value = 0 V
Repeat the check of the sensor circuit insulation from the ground.

OK

Check the connection to the central unit.
Check central unit supply.
Replace the central unit if necessary.

NO

Restore or replace the connections.

OK

Start the engine and make sure that the voltage decreases along with the increase in the airbox temperature.

NOTE *- In case of mild weather, the temperature of 30° C is easily reached when stopping the motorcycle a few minute at idling engine.*

17. PRESSURE SENSOR

There is not a system connected to this sensor as it is directly assembled inside the central unit.
The sensor allows the central unit optimising the engine performances according to altitude change.

In order to check the sensor operation, proceed as follows:

Connect the diagnostic multimeter.
Select the menu from the "ERRORS" function. Check the pressure sensor for anomalies.

Parameters		Throttle	
Immobilizer		**Pressure**	
Errors		Water temperature	
Delete errors		Air temperature	
Active diagnostics		Battery voltage	
CO calibration		Injector	
Main	3/8	Errors	1/3 AM

OK

NO

Replace the injection central unit.

Select the menu from the **"PARAMETERS"** function**.**
Check that the pressure indication expressed in mm/Hg matches the value indicated by another motorcycle or outdoor barometer. Max. allowed error: ±20 mmHg.

Lost synchronisations 1D	0
Lost synchronisations > 1D	0
TPS reset	NO
CO already calibrated	NO
R/O step difference	55
Atmospheric pressure mmHg	783.0
Parameters	3/3

OK

NO

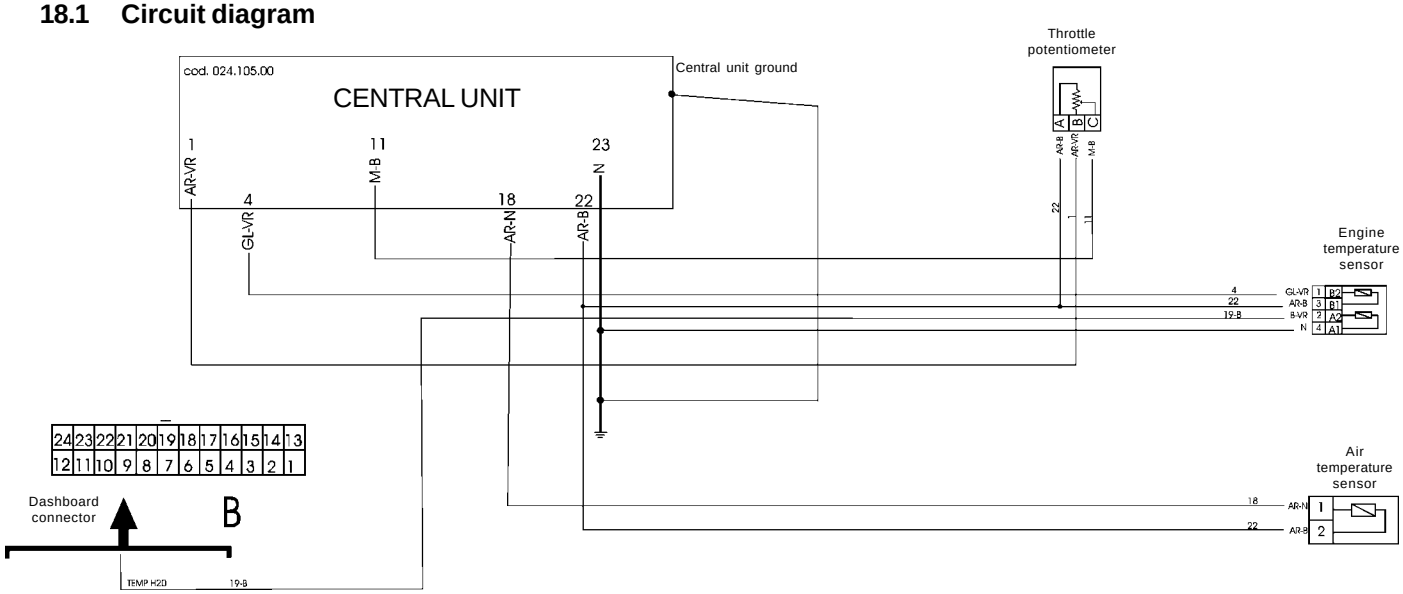
The room pressure signal is correct.

Replace the injection central unit.

18. GAS VALVE POSITION SENSOR (T.P.S. = THROTTLE POSITION SENSOR)

TERMINALS	CONDITIONS	STANDARD
1 - 22	Key switch on the “ON” position	5 V
11 - 22	Open the gas valve gradually	V=gradual increase

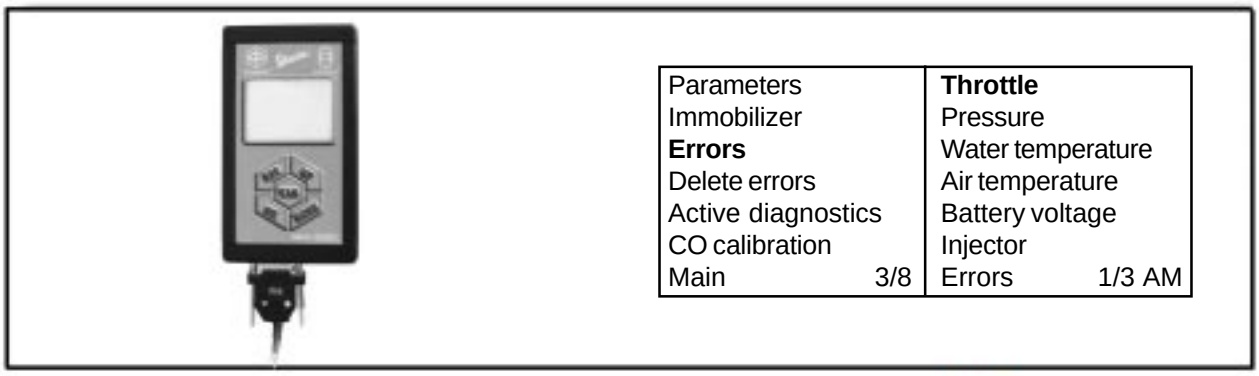
18.1 Circuit diagram



Sch. 11

The gas valve position sensor is assembled inside the throttle body and cannot be removed.
The sensor receives a 5V-supply from the central unit and transfer a gradually increasing voltage to the central unit according to the opening of the gas valve. The central unit transforms the voltage into the angular inclination of the valve.
The engine rpm and the gas valve position are the two basic signals for the engine operation management.
In case of failure of the circuit, the injection led and the protections turn on. In these conditions, the engine operates, even if not at its best, safeguarding the integrity of the catalytic converter.
The gas valve position signal is important especially in case of small openings of the valve; these are the conditions in which the sensor works more often thus requiring frequent checks after covering a remarkable distance.

In order to check the sensor and the circuit, proceed as follows:
Connect the diagnostic multimeter.
Move the key switch to the “ON” position, the emergency switch to “RUN” and lift the side stand.
Select the multimeter menu from the ”ERRORS” function.
Check whether the central unit detected any anomaly concerning the gas valve position signal.



Parameters	**Throttle**
Immobilizer	Pressure
Errors	Water temperature
Delete errors	Air temperature
Active diagnostics	Battery voltage
CO calibration	Injector
Main 3/8	Errors 1/3 AM

NO

Select the diagnostic multimeter menu from the **"PARAMETERS"** function**.**
Make sure that the central unit can recognise the following limit positions:
gas valve min. opening
gas valve max. opening

Parameters		Throttle value mV.	817
Immobilizer		Battery voltageV	11.7
Errors		Stepper motor steps	96
Delete errors		Engine running	NO
Active diagnostics		Syncr. panel	NO
CO calibration		Min. or max. throttle	YES
Main	1/8	Parameters	2/3

NO

Check the adjustment of the flexible control transmissions of the gas valve.

NO

Restore or replace.

OK

Open the throttle valve gradually, make sure that the value expressed in mV increases gradually and according to the opening change.

OK

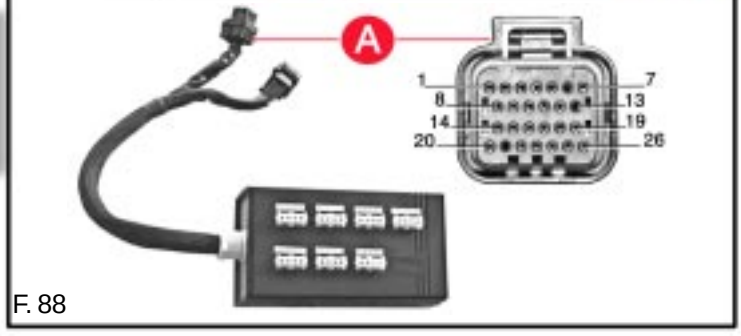
The gas valve position signal is normal.

NO

OK

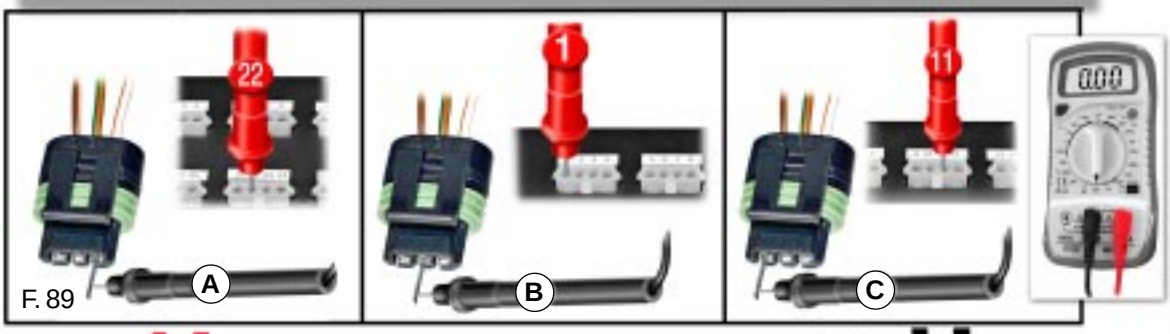
OK

Connect the testing wiring to the system connector.
Do not connect the connection to the central unit.



F. 88

Disconnect the gas valve position sensor connector.
Check the continuity across the connector **PIN** and related **PINS** on the central unit side.
Orange/white - PIN 22 = 0Ω (continuity) **Orange/green - PIN 1** = 0Ω (continuity)
Brown/white - PIN 11 = 0Ω (continuity)



F. 89

NO

Restore or replace the connections.

OK

Check the insulation of the three circuit lines from the ground.

PIN 22 - PIN 23 = Ω infinitive (>1MΩ)
PIN 1 - PIN 23 = Ω infinitive (>1MΩ)
PIN 11 - PIN 23 = Ω infinitive (>1MΩ)

F. 90

NO

Restore or replace the connections.

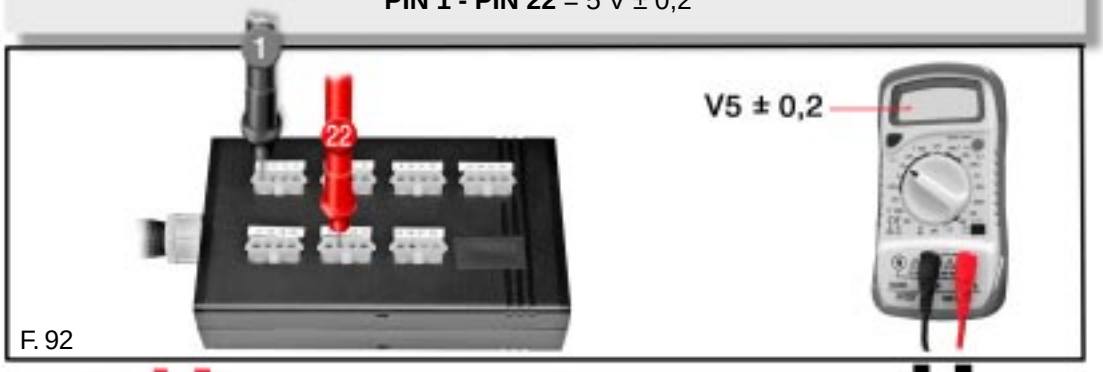
OK

Connect the testing wiring to the central unit.
Move the key switch to the “ON” position, the emergency switch to “RUN” and lift the side stand.

F. 91

Measure the voltage across the **testing wiring PIN 1** and **PIN 22**.

PIN 1 - PIN 22 = 5 V ± 0,2



F. 92

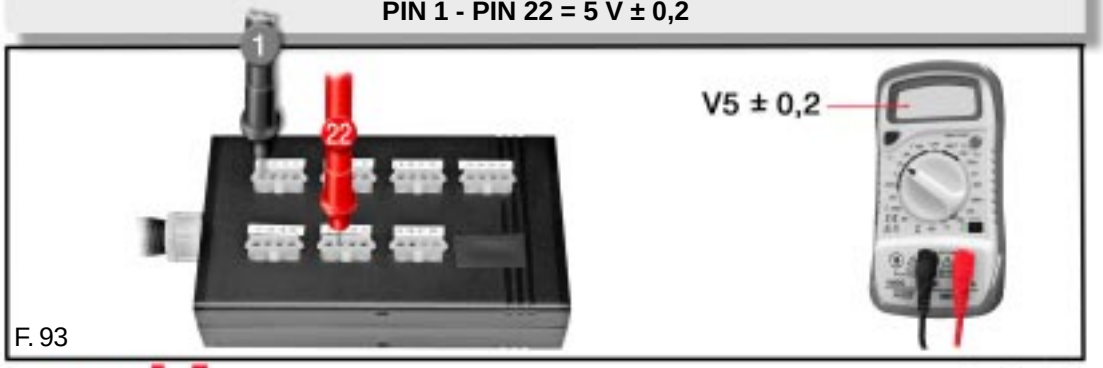
NO

Check the connection to the central unit.
Replace the central unit, if necessary.

OK

Connect the gas valve position sensor connector. Measure again the voltage across the testing wiring **PIN 1 and PIN 22.**

PIN 1 - PIN 22 = 5 V ± 0,2



F. 93

OK

Measure the voltage across **PIN 11** and **PIN 22**. Open the throttle valve gradually and make sure that the voltage value increases gradually.

PIN 11 - PIN 22 = V (gradual increase).

***NOTE** - The limit voltage values may vary from ÷ 700mV, as min. value, to more than 4V, as max. value. Any possible limit value change can be generated by the sensor assembling tolerances.*

NO

NO

OK

Replace the throttle body the sensors and the stepper motor.

OK

Check that the voltage measured across **PIN 11** and **PIN 22** matches the voltage indicated by the diagnostic multimeter set on “PARAMETERS”.

Throttle value mV.	817
Battery voltage V	11.7
Stepper motor steps	96
Engine running	NO
Syncr. panel	NO
Min. or max. throttle	NO
Parameters	2/3

NO

Replace the central unit.

OK

The gas valve position sensor and circuit are normal.

***NOTE** - The gas valve position sensor check has been configured with voltaic testing as the resistive checks do not give reliable results.*
In order to check the throttle body potentiometer we suggest to connect it to a motorcycle, even if only electrically.

19. GAS VALVE POSITION SIGNAL RESET (T.P.S. RESET)

The throttle body is supplied along with a calibrated gas valve position sensor.
The calibration is performed by adjusting the gas valve to a minimum opening aimed at allowing a determined air flow at pre-defined conditions.
The calibration allows having an optimised air flow for the management of the engine idling speed.
Never attempt to change this calibration.
The injection system controls the idling speed by means of the stepper motor and the spark advance change.
After the calibration the throttle body valve opens at an angle that varies according to the work tolerance of the duct and the valve itself.
Also the valve position sensor may have different assembling positions. For these reasons, the sensor mV value with the valve minimum opening, may vary depending on the throttle body type.
In order to get the best carburetion, especially with the smallest gas valve openings, it is necessary to combine the throttle body and the central unit, by means of the so.-called “TPS reset” procedure.
This procedure allows indicating to the central unit the starting point, the value expressed in mV corresponding to the calibration position. The central unit will recognise this position as a 5,24° angle.

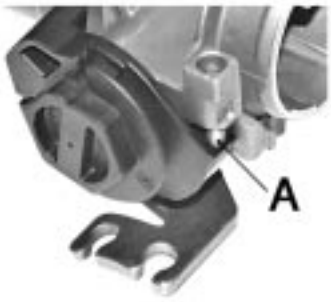
In order to reset the value, proceed as follows:

- Connect the diagnostic multimeter.
- Move the key switch to the “ON” position, the emergency switch to “RUN” and lift the side stand.

- Select the diagnostic multimeter function from "TPS reset".

Immobilizer
Errors
Delete errors
Active diagnostics
CO calibration
Reset TPS
Main 7/8

- Make sure that the gas valve control rests on the locking screw (A).



- Making sure to retain this position, confirm to start the TPS reset procedure.

Check the throttle stroke

Press OK to start the TPS reset

- Select the "PARAMETERS" function and make sure the TPS reset "YES" is present.

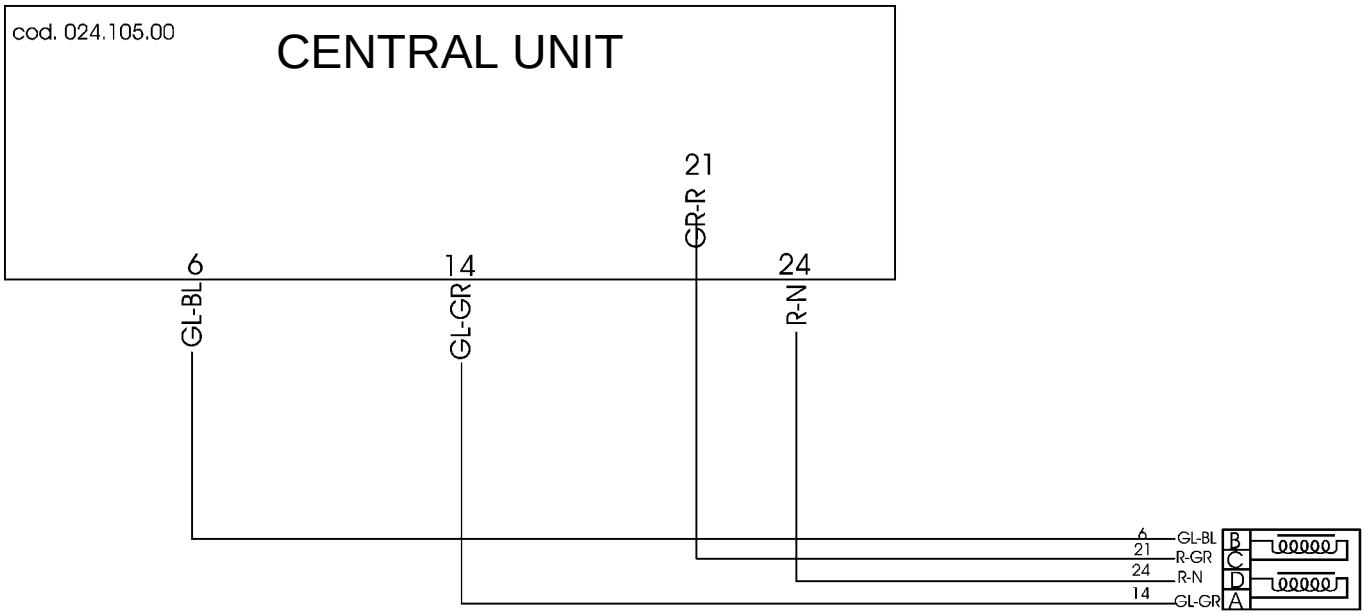
Lost synchronisations 1D	0
Lost synchronisations > 1D	0
TPS reset	YES
CO already calibrated	NO
R/O step difference	0
Atmospheric press . mm Hg	783.0
Parameters	3/3

Carry out the reset procedure in the following situations:
- when assembling the equipment for the first time
- when replacing the throttle body
- when replacing the injection central unit.

NOTE *- Do not carry out the TPS reset procedure with a used throttle body as the valve wear and even the smallest opening may change the air flow with respect to the calibration air flow.*

20. STEPPER MOTOR

20.1 Circuit diagram



Sch. 12

The throttle body is equipped with a secondary air circuit controlled by a piston-valve operated by a stepper-motor.
The central unit send an input to the stepper motor only when it is necessary to change the valve opening.
The engine revolutions are divided into fractions called steps: by changing the opening steps it is possible to supply the engine in order to ease the start-up procedure and correct the air intake at cold engine.
Once the engine has reached the operating temperature, the stepper motor has partially closed back.
In order to prevent the adjustment piston excessive wear, the operating rpm is achieved by means of a minimum opening of around 45 steps.
Every time the key switch is moved to the “OFF” position the piston travels fully home and opens for a number of pre-defined steps (auto-reset) until it seats properly.
When it changes the stepper motor opening steps, the central unit also modifies the injection time in order to ensure a correct carburetion.
The idling speed is stabilised around 1450÷50 RPM. After the start-up at warm engine, the first rpm increase can be heard, followed by the consequent closing of the stepper motor aimed at stabilising the engine rpm.
In case of rpm anomalies, before performing any electrical check, make sure that the gas valve and secondary air circuit are properly cleaned.

In order to check the stepper motor and its circuit, proceed as follows:

Connect the **diagnostic multimeter**.
Move the key switch to the "ON" position, the emergency stop to "RUN" and lift the side stand.

Select the menu from the "ERRORS" function. Check the stepper motor for anomaly detected by the central unit.

Parameters		H.T. coil	
Immobilizer		**Stepper motor**	• •
Errors		Pump relay	
Delete errors		Fan relay	
Active diagnostics		Signal panel	
CO calibration		RAM memory	
Main	3/8	Errors	2/3 A M

NO

Select the menu from the "**PARAMETERS**" function. Check the number of "**STEPS**" defined by the central unit for the start-up.
This setting varies according to the engine temperature. **20° C = ~ 1350 ÷ 140 steps**

Parameters		Throttle value mV.	817
Immobilizer		Battery voltage V	11.7
Errors		Stepper motor steps	135
Delete errors		Engine running	NO
Active diagnostics		Sync. panel	NO
CO calibration		Min. or max throttle	YES
Main	1/8	Parameters	2/3

OK

Start the engine and let it warm up.
When the coolant temperature is above 70 °C, the central unit orders the stepper motor to perform 45 **steps**.

Throttle value mV.	817
Battery voltage V	12.8
Stepper motor steps	45
Engine running	YES
Sync. panel	YES
Min. or max throttle	YES
Parameters	2/3

OK NO NO OK

NO

NO

Check for the coolant temperature sensor signal.
Replace the central unit if necessary (see p. 97).
Repeat the test (p. 113).

OK

Select the menu from the "**ACTIVE DIAGNOSTICS**" function.
Select the "**STEPPER MOTOR**" diagnosis.

Parameters		Fuel pump relay	
Immobilizer		H.T. coil	
Errors		**Stepper motor**	
Delete errors		Rev. counter	
Active Diagnostics		Injector	
CO calibration		Fan relay	
Main	5/8	Diagnosis	3/6

Start the diagnosis with the engine idling and warm.
Make sure that the stepper motor controls the rpm change and wait for the diagnostic multimeter reading.

NO

OK

Test ended with success.
Rpm change can be heard.

Test failed.
No rpm change.

The stepper motor and circuit operates properly.

Test ended with success. No rpm change. Remove the throttle body (see chapter THERMAL UNIT AND TIMING - Engine Manual).
Make sure the secondary intake air circuit is cleaned. Move the key switch from the "ON" to the "OFF" position and then back to "ON" and check for the piston valve movement.

F. 94

NO

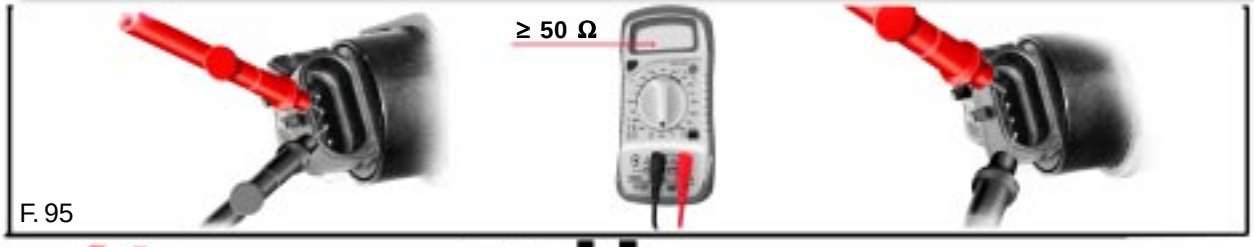
OK

In case the valve does not move, replace the throttle body (see chapter THERMAL UNIT AND TIMING - Engine Manual).

OK

Perform the stepper motor circuit test.

Disconnect the stepper motor connector. Test the stepper motor circuit resistance by connecting the multimeter as shown in the picture. The two readings must give the same value.
Resistance = **=** 50 Ω



F. 95

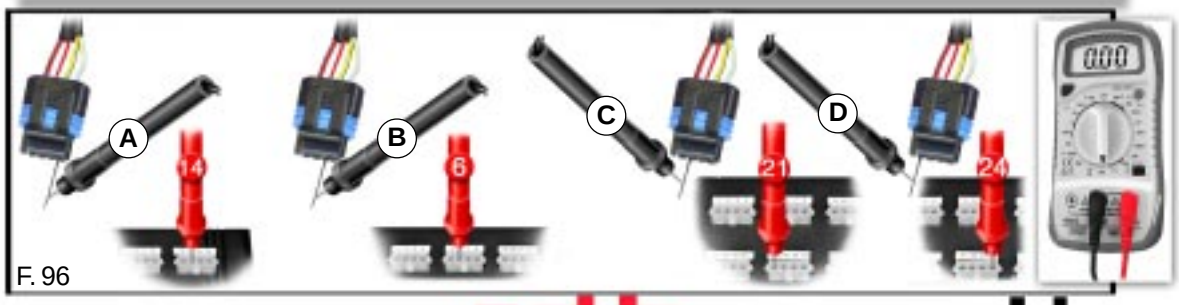
NO

Connect the testing wiring but **do not connect the connector to the central unit**. Replace the throttle body (see chapter THERMAL UNIT AND TIMING - Engine Manual).

OK

Connect the testing wiring. **Do not connect the central unit** to perform these checks.

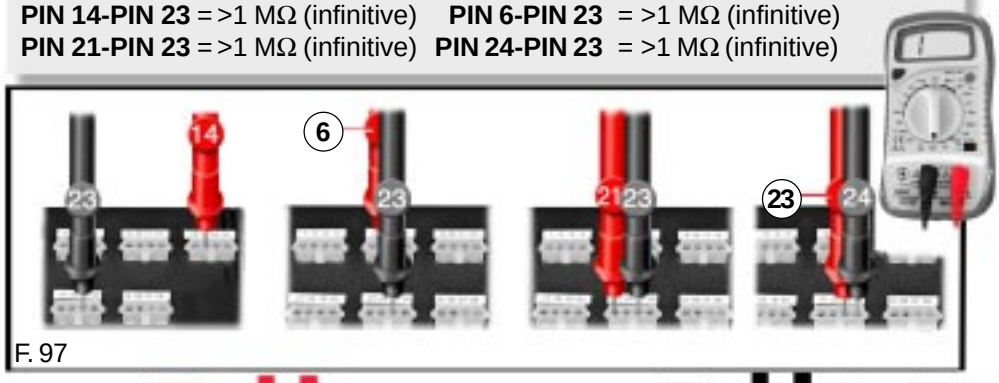
Verify the continuity of the 4 stepper motor supply lines. (0Ω = continuity)
PIN A - (yellow/**gray cable**) - **PIN 14** = 0Ω **PIN B** - (yellow/**blue cable**) - **PIN 6** = 0Ω
PIN C - (red/**gray cable**) - **PIN 21** = 0Ω **PIN D** - (red/**black cable**) - **PIN 24** = 0Ω



F. 96

OK

Make sure that the 4 stepper motor lines are properly insulated from the ground.
PIN 14-PIN 23 = >1 MΩ (infinitive) **PIN 6-PIN 23** = >1 MΩ (infinitive)
PIN 21-PIN 23 = >1 MΩ (infinitive) **PIN 24-PIN 23** = >1 MΩ (infinitive)



F. 97

OK

NO

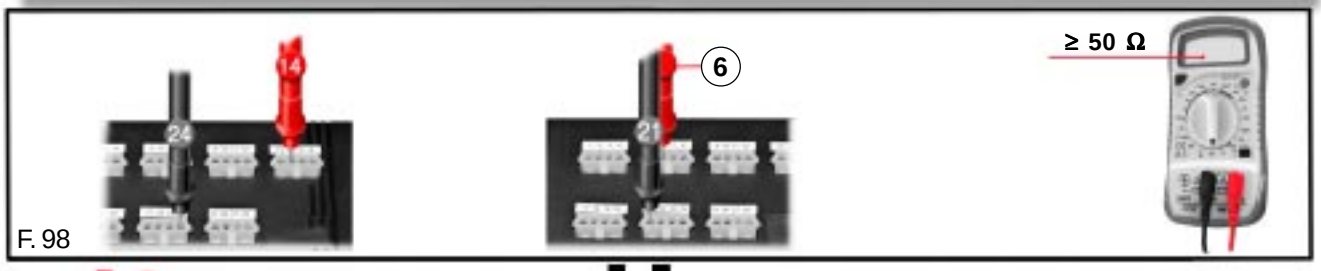
NO

NO NO

Repair or replace the connections. Repeat the test.

OK

Connect the stepper motor connector. Repeat the continuity test by means of the testing wiring **PINS**.
PIN 14 - PIN 24 ≥ 50 Ω **PIN 6 - PIN 21** ≥ 50 Ω



F. 98

NO

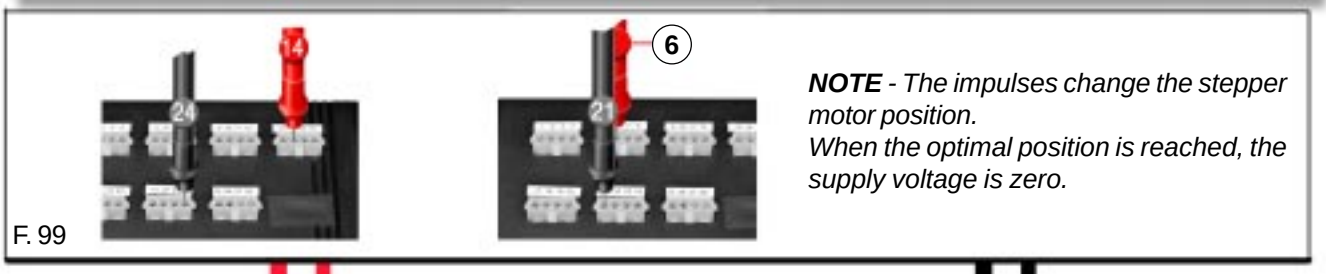
OK

Verify again wiring and connectors with the greatest care.

Connect the central unit connector. Move the key switch to the "ON" position, the emergency stop to "RUN" and lift the side stand.

While switching to key from "ON" to "OFF" and to "ON" again, make sure there are voltage impulses on the stepper motor control lines.

Configure the multimeter for continuous current reading (V =).
PIN 14 - PIN 24 = V (impulses for a few seconds).
PIN 6 - PIN 21 = V (impulses for a few seconds).



F. 99

***NOTE** - The impulses change the stepper motor position.*
When the optimal position is reached, the supply voltage is zero.

OK

The stepper circuit operation is normal.

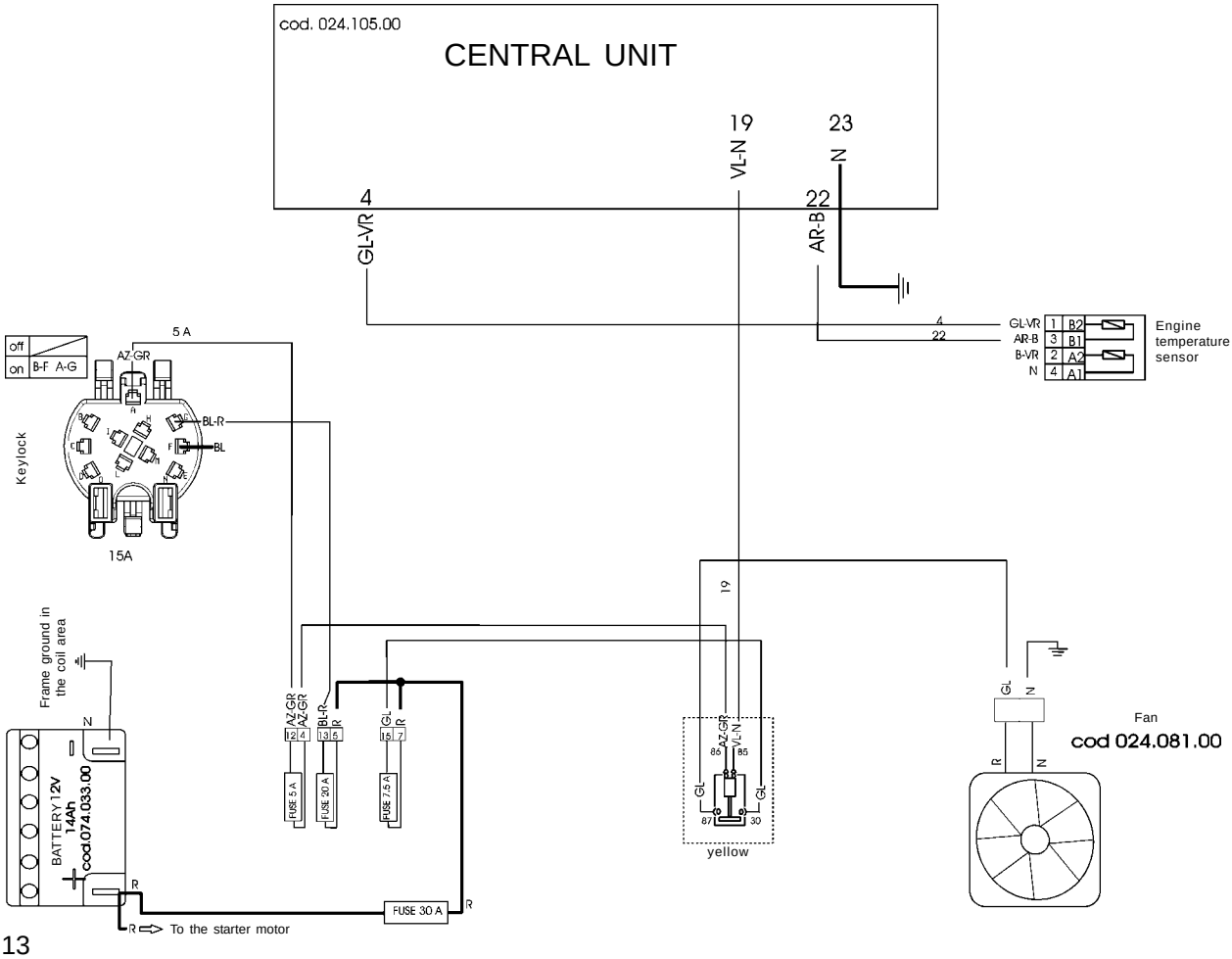
NO

Check for the central unit connector condition and replace the central unit, if necessary.

21. FAN CONTROL CIRCUIT

TERMINAL	CONDITIONS	STANDARD
19 - 23	Move the key switch to the "ON" position, the emergency stop to "RUN" and lift the side stand. Fan off.	Battery voltage

21.1 Circuit diagram



Sch. 13

The fan system is supplied by a relay under the dashboard and controlled by the injection central unit.

The injection central unit controls the fan according to the temperature measured on the engine.
In case the fan rotates for a longer period than usual, before checking the electrical system, verify with care the:
- reservoir cap level;
- second radiator bleeding (motorcycle right hand side);
- outlet bleeding from the head;
- thermal expansion valve operation ;
- pump operation.

In order to check the circuit, proceed as follows:

Connect the diagnostic multimeter. Move the key switch to the “ON” position, the emergency stop to “RUN” and lift the side stand. Select the menu from the “ERRORS” function. Check the fan control circuit for anomalies signalled by the central unit.

Parameters	**H.T. coil**
Immobilizer	Stepper motor
Errors	Fuel pump relay
Delete errors	Fan relay • •
Active diagnostics	Signal panel
CO calibration	RAM memory
Main 3/8	Errors 2/3 A M

NO

Select the menu from the “ACTIVE DIAGNOSTICS” function. Enable the fan diagnostic function. Make sure that the fan rotation can be heard.
Wait for the diagnostic multimeter reading.

Parameters	Fuel pump relay
Immobilizer	H.T. coil
Errors	Stepper motor
Delete errors	Revolution counter
Active diagnostics	Injector
CO calibration	**Fan relay**
Main 5/8	Diagnosis 6/6

OK

A) Test ended with success.
The fan rotates.

The fan system operation is normal.

NO

B) Test ended with success.
The fan failed.

The relay control circuit operates properly. Verify the fan connector, the relay contacts, the positive lines, the negative line and the fan motor.

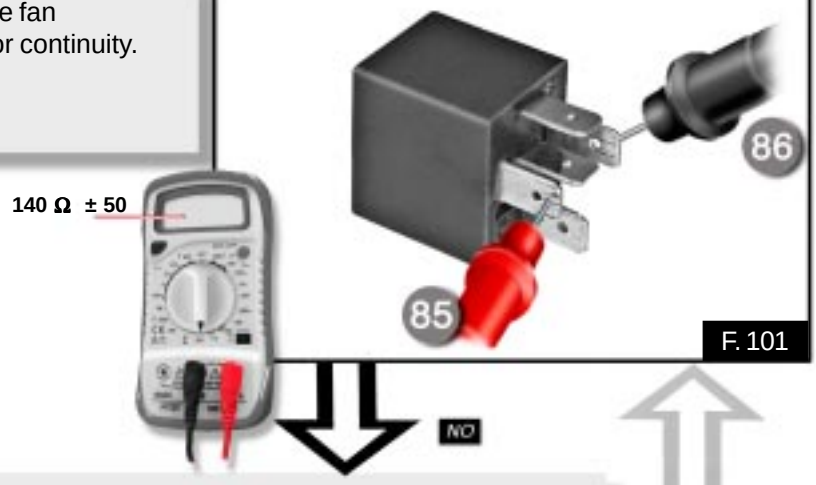
NO

C) Test failed.
The fan does not rotate.

OK

Disconnect the yellow relay of the fan control. Check the excitation coil for continuity.

PIN 85 - PIN 86 = 140 Ω ± 50.



F. 101

OK

NO

Replace the fan relay

OK

Connect the **testing wiring** to the system connector. **Do not connect the central unit.**

Move the key switch to the “ON” position.
Check the relay yellow connector voltage across **PIN 86**.
PIN 86 (fair blue/gray) – PIN 23 = Battery voltage with the key on the “ON” position.

F. 102

OK

NO

Restore the fair blue/gray cable continuity (see electrical diagram).

OK

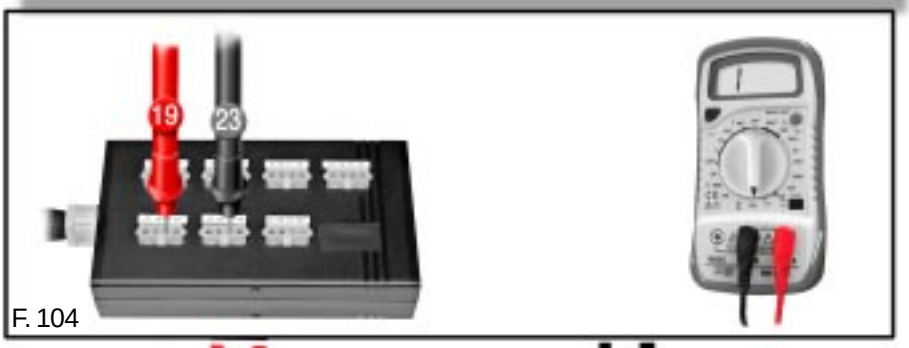
Without connecting the relay:

A) Check the continuity across the yellow connector **PIN 85** and the central unit **PIN 19**.
PIN 85 (purple/black) - **PIN 19 =** 0Ω (continuity).

F. 103

OK

B) Make sure it is insulated from the ground.
PIN 19 - PIN 23 = 1 MΩ (infinitive)



F. 104

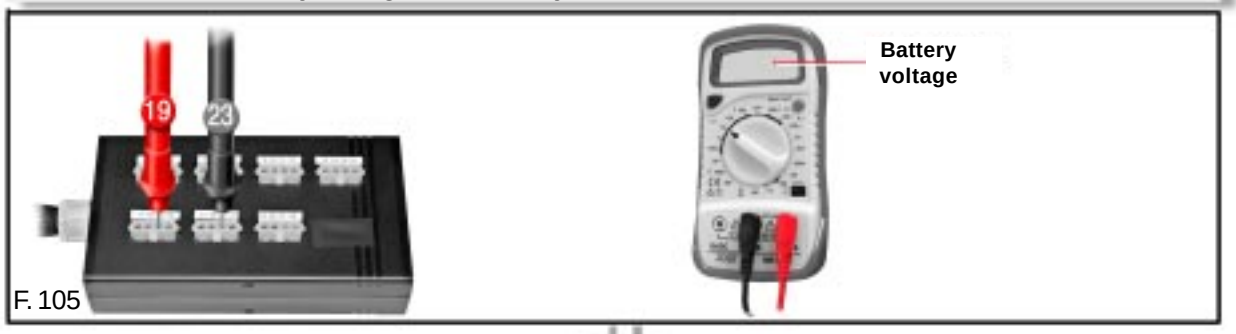
NO → B

NO → A

Restore:
A) **Purple/black** cable continuity
B) The **purple/black** insulation from the ground

OK

Connect the relay and make sure the battery voltage is present across **PIN 19** and **PIN 23** when the key switch is on the "ON" position.
PIN 19 - PIN 23 = battery voltage with the key switch on "ON".



F. 105

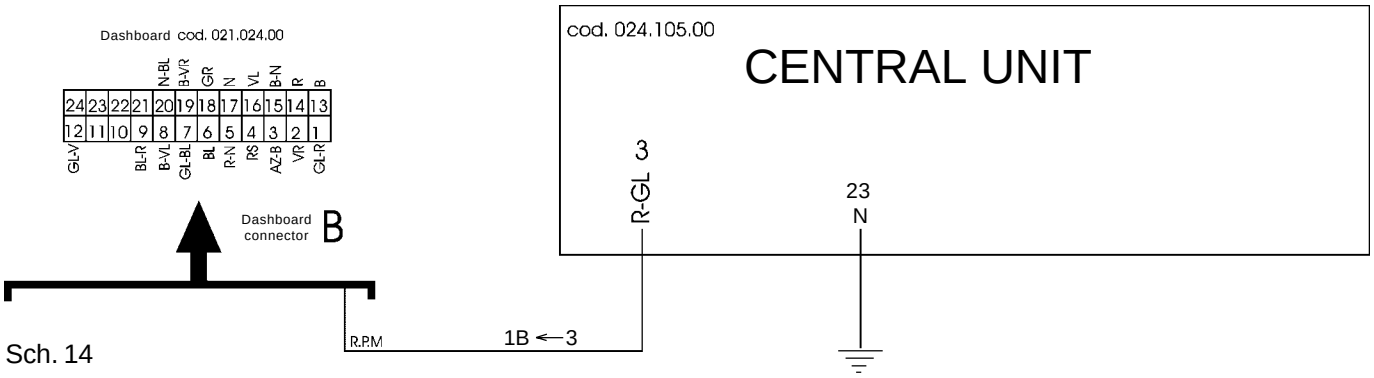
Perform the test once again with the **central unit connected, cold engine** and the key switch on the "ON" position. **PIN 19 - PIN 23** = battery voltage.

In case the anomaly persists, replace the central unit.

22. REV. COUNTER CONTROL CIRCUIT

TERMINALS	CONDITIONS	STANDARD
3 - 23	- key switch on the “ON” position - emergency stop on “RUN” - side stand lifted - engine not running	**9 ÷ 10 Volt**

22.1 Circuit diagram


Dashboard cod. 021.024.00
N-BL B-VR GR N VL B-N R B
24 23 22 21 20 19 18 17 16 15 14 13
12 11 10 9 8 7 6 5 4 3 2 1
GI-V BL-R B-VL GI-BL BL R-N RS AZ-B VR GI-R
Dashboard connector B
R.P.M
1B ←3
cod. 024.105.00
CENTRAL UNIT
3
R-GL
23
N

Sch. 14

The digital dashboard receives the engine rpm signal from the injection central unit.
To check the rev. counter and its control circuit, proceed as follows:

Connect the diagnostic multimeter. Move the key switch to the “ON”, the emergency switch to “RUN” and lift the side stand.

Select the menu from the “ACTIVE DIAGNOSTICS” function and enable the **rev. counter diagnosis**. Make sure that the rev. Counter gets to **3500 rpm** and then back to zero.

Parameters	Fuel pump relay
Immobilizer	H.T. coil
Errors	Stepper motor
Delete errors	**Rev. counter**
Active diagnostics	Injector
CO calibration	Fan relay
Main 5/8	Diagnosis 4/6

OK

The rev. counter control operates properly.

NO

Connect the testing wiring to the system connector but **do not connect the central unit**.

Disconnect the dashboard connector. Do not connect the central unit.
Check the yellow/red cable for continuity.
PIN 1 (dashboard) → **PIN 3** (central unit) = **0Ω (continuity)**

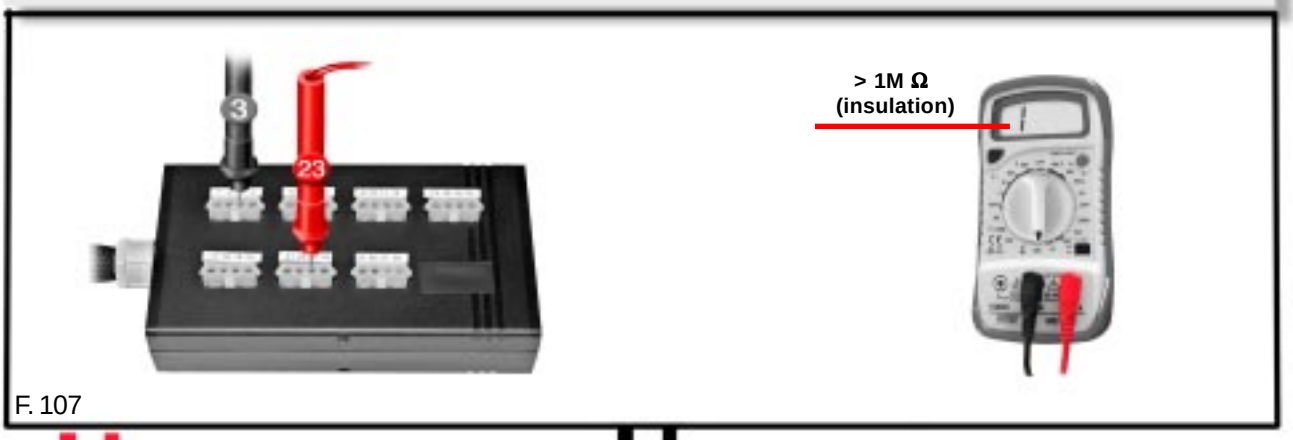
F. 106

NO

Restore the **yellow/red** cable continuity across the central unit **PIN 3** and the dashboard **PIN 1**.

OK

Make sure that **PIN 3** and **PIN 23** are insulated from the ground.



F. 107

NO

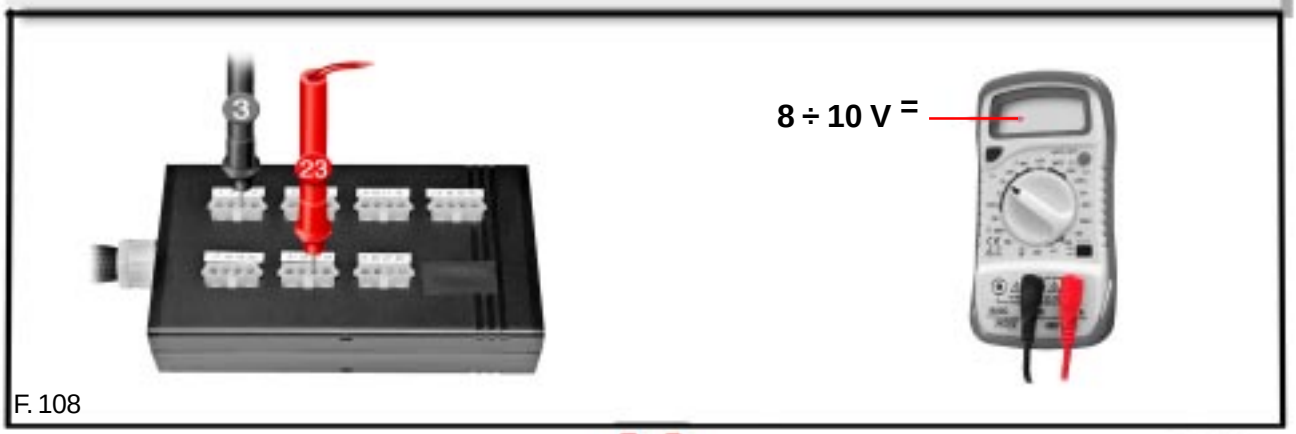
Restore the **yellow/red** cable continuity across the central unit **PIN 3** and the dashboard **PIN 1**.

OK

OK

Connect the central unit. Move the key switch to the “ON” position, the emergency switch to “RUN” and lift the side stand.

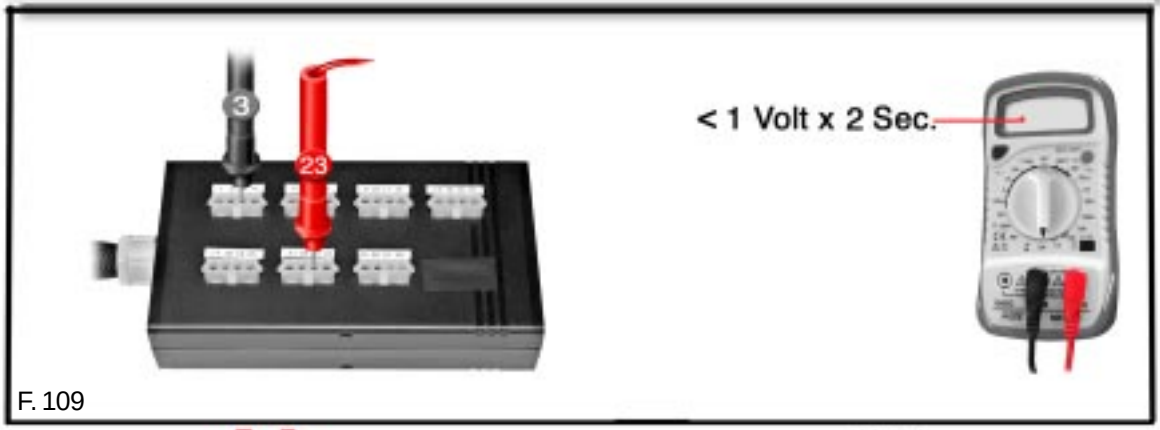
Measure the voltage across **PIN 3** and **PIN 23** with the engine not running.



F. 108

OK

Use the diagnostic multimeter for the rev. counter check. Measure the voltage again **.**
PIN 3 - PIN 23 < 1V for a few seconds.



F. 109

OK

The rev. counter control circuit operates properly.
Replace the dashboard.

NO

NO

Replace the central unit.

23. LAMBDA SENSOR
Signal check

• Connect the checking wiring to the ECU.

• Start the engine and make it warm up until the electric fan engages.

• Use an analogic multimeter and set the direct current reading full scale to 2V (DC 2V).

• Fit the multimeter prods across pin 2 (-) and 8 (+).

F. 110

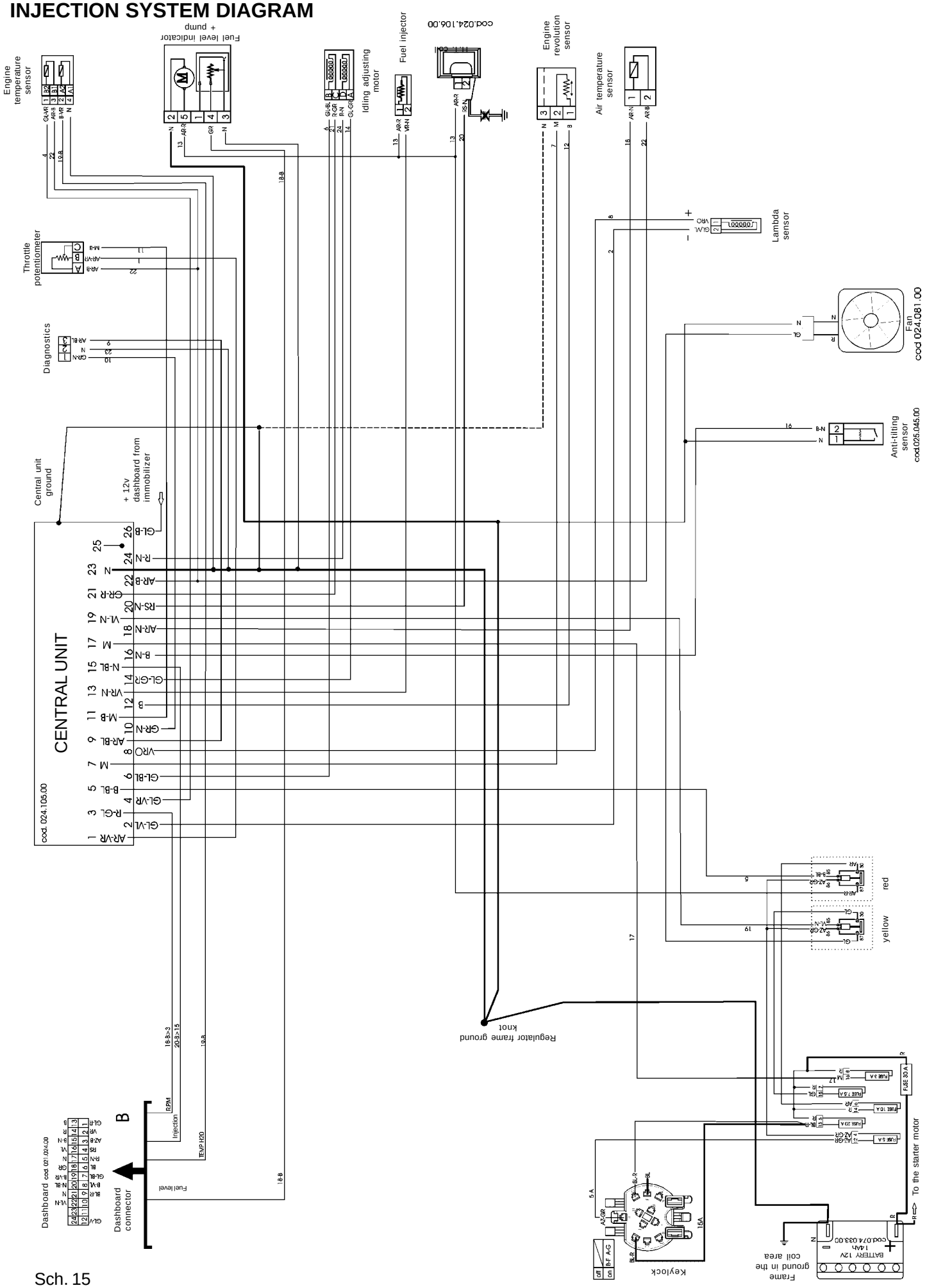
• With the engine idling, check that the voltage value is within **0 V** and **1 V.**

• With the throttle completely opened, the voltage value is **~ 1 V.**

• During the release phase, the voltage is **~ 0 V.**

• If the voltage value is constant, the sensor may be faulty. Disassemble the sensor and check that there are no oil deposits or coke.

INJECTION SYSTEM DIAGRAM



Sch. 15

NOTES